

刘纪彩，教授，博士生导师

主C1137，Tel：010-61772163，E-mail：[jicailiu@ncepu.edu.cn](mailto:jicailiu@ncepu.edu.cn)

主要研究方向：

（1）强场超快激光核动力学过程研究Ultrafast nuclear dynamics in strong laser field

（2）时间分辨泵浦—探测X射线谱研究Time-resolved pump-probe X-ray spectroscopy

（一）个人简介

2003.6年在山东师范大学物理学专业获得学士学位，2006.6年在山东师范大学原子与分子物理学专业获得硕士学位，2009.6年在山东师范大学原子与分子物理学专业获得博士学位，2009.12年在瑞典皇家工学院理论化学系获得博士学位，并获得教育部国家优秀自费留学生奖学金。2010.6-2011.8德国马普核物理研究所博士后，2011.5-2012.12年华北电力大学数理学院讲师，2012.7-2012.9美国阿贡国家实验室X射线科学部访问学者，2013.1-2020.4华北电力大学数理学院副教授、硕士生导师，2020.4-华北电力大学数理学院教授，2021.9被聘为博士生导师。

主要从事强场超快激光原子、分子、核量子动力学及X 射线光谱学领域的研究工作，发展和完善了研究超快激光与原子、分子相互作用的理论和计算方法，并将计算方法程序化，在超快分子、核量子动力学和光谱学领域积累了较为丰富的研究经验，并且取得了一定的创新性成果。已在Proc. Natl. Acad. Sci. USA, Phys. Rev. Lett., Phys. Rev. A, J. Chem. Phys.,J. Phys. Chem. B 等有重要影响力的期刊上发表学术论文50余篇。作为项目负责人主持国家自然科学基金项目3 项，教育部留学回国启动基金1 项、国家外国专家局单位重点项目5项、科技部高端外专项目1项，有关科研成果获山东省自然科学奖二等奖1项。

（二）教学与人才培养情况

1.教学课程：

本科生课程：原子物理学（48学时）、计算物理基础(40学时)、计算物理实践（8学时）、物理前沿专题（2学时）、物理实验

研究生课程：激光物理学（48学时）

留学生课程：Laser Physics （48学时）

2.研究生培养

毕业硕士：李兴哲（2017届）、张莹（2018届）、郭芬芬（2019届）、赵亚男（2020届）、成飞（2021届）

在读研究生：李杰（2019级）、管文慧（2020级）、袁硕（2021级）

（三）主持科研项目

1. 国家自然科学基金面上项目，高能X射线光子作用下的分子反冲效应及相关X射线谱研究，2020.1-2023.12，62万

2. 国家自然科学基金面上项目，低于电离阈值的谐波产生机制及其相干控制的理论研究，2016.1-2019.12，70.9万

3. 科技部高端外国专家引进计划项目，光物理学在材料及能源领域的应用研究，2019.7-2020.7，31.8万

4. 国家自然科学基金青年项目，强场相对论条件下相干硬X 射线光子的产生及传播效应研究，2013.1-2015.12，25万

5. 国家外国专家局单位重点项目，高分辨振转俄歇电子谱研究，2018.1-2018.12，6.6万

6. 国家外国专家局单位重点项目，电磁矢势高阶项在强场X 射线光辐射中的作用， 2017.1-2017.12，6.6万

7. 教育部留学回国启动基金项目，利用低于电离阈值的高次谐波产生获得高能X 射线光子辐射，2013.7-2014.12，3万

（四）主要学术奖励

1. 山东省人民政府，2018年，山东省自然科学奖，二等奖， 第3位

2. 教育部，国家优秀自费留学生奖学金（本年度全球共496人），2009

（五）代表性学术论文（\*通讯作者）

1. Viktoriia Savchenko, **Ji-Cai Liu**\*, Michael Odelius, Nina Ignatova, Faris Gel'mukhanov, Sergey Polyutov, and Victor Kimberg\*, Photodissociation of water induced by a long UV pulse and probed by high-energy-resolution x-ray-absorption spectroscopy, ***Phys. Rev. A*** **104**, 032816 (2021).
2. **Ji-Cai Liu\***, Viktoriia Savchenko, Victor Kimberg, Faris Gel’mukhanov, and Michael Odelius\*, High-resolution x-ray spectra of carbon monoxide reveal ultrafast dynamics induced by long UV pulse, ***New J. Phys.* 23**, 063030 (2021).
3. **Ji-Cai Liu\***, Viktoriia Savchenko, Victor Kimberg\*, Michael Odelius, and Faris Gel’mukhanov, Polarization-sensitive IR-pump–x-ray-probe spectroscopy, ***Phys. Rev. A* 103**, 022829 (2021).
4. Zhi Xiao\*, Shuang Zheng and **Ji-Cai Liu**\*, The quantum scattering time in a linear potential, ***J. Phys. B: At. Mol. Opt. Phys.*** **54**, 105602 (2021).
5. **Ji-Cai Liu\***, Catalin Miron, Hans Ågren, Sergey Polyutov and Faris Gel’mukhanov, Resonant X-ray second harmonic generation in atomic gasses, ***Phys. Rev. A* 100**, 063403 (2019).
6. **Ji-Cai Liu\***, Vinícius Vaz da Cruz\*, Sergey Polyutov, Alexander Föhlish, and Faris Gel’mukhanov, Recoil-induced dissociation of hard X-ray photoionization, ***Phys. Rev. A* 100**, 053408 (2019).
7. Denis Céolin\*, **Ji-Cai Liu\***, Vinícius Vaz da Cruz, Hans Ågren, Loïc Journel, Renaud Guillemin, Tatiana Marchenko, Rajesh K. Kushawaha , Maria Novella Piancastelli, Ralph Püttner\*, Marc Simon, and Faris Gel’mukhanov, Recoil-induced ultrafast molecular rotation probed by dynamical rotational Doppler effect, ***PNAS*** **116**(11), 4877-4882 (2019).
8. **Ji-Cai Liu\***，Fen-Fen Guo, Ya-Nan Zhao, Ye-Qi Zhang, Time-frequency analysis of ultrafast dynamics in cascade three-level system driven by hyper-Gaussian pulses, ***Opt. Commun.*** **438**, 25-33 (2019).
9. **刘纪彩\***，成飞，赵亚男，郭芬芬，飞秒激光场中原子所受光学偶极力研究，***物理学报*** **68**, 033701 (2019).
10. **Ji-Cai Liu\***，Fen-Fen Guo, Ya-Nan Zhao, Xing-Zhe Li, Optical power limiting of ultrashort hyper-Gaussian pulses in cascade three-level system, ***Chin. Phys. B*** **27**, 104209 (2018).
11. **Ji-Cai Liu**，Nora Berrah, Lorenz S Cederbaum, James P Cryan, James M Glownia, Kenneth J Schafer and Christian Buth, Rate equations for nitrogen molecules in ultrashort and intense x-ray pulses, ***J. Phys. B: At. Mol. Opt. Phys.*** **49**, 075602 (2016).
12. **J.-C. Liu\***, Weakly relativistic electron dynamics and efficient x-ray photon emission driven by an ultraintense extreme-ultraviolet laser field, ***J. Electron Spectrosc. Relat. Phenom.*** **195**, 132-138 (2014).
13. **J.-C. Liu\***, Y.-Q. Zhang, L. Chen, Coherent control of nondegenerate two-photon absorption by femtosecond laser pulses, ***J. Mod. Opt.*** **61**, 781-786 (2014).
14. Quan Miao, **Ji-Cai Liu\***, Hans Ågren, Jan-Erik Rubensson and Faris Gel'mukhanov, Dissociative x-ray lasing, ***Phys. Rev. Lett.* 109**, 233905 (2012).
15. **J.-C. Liu**, M. C. Kohler, C. H. Keitel and K. Z. Hatsagortsyan, Coherent x-ray generation from below-threshold harmonics, ***Phys. Rev. A* 84**,063817 (2011).
16. **J.-C. Liu**, C. Nicolas, Y. Sun, R. Flammini, P. O’Keeffe, L. Avaldi, P. Morin, V. Kimberg, N. Kosugi, F. Gel'mukhanov, and C. Miron, Multimode resonant Auger scattering from the ethylene molecule, ***J. Phys. Chem. B*** **115**, 5103 (2011).
17. G. J. Tian, **J.-C. Liu**, Y. Luo, Density-Matrix Approach for the Electroluminescence of Molecules in a Scanning Tunneling Microscope, ***Phys. Rev. Lett.* 106**, 177401 (2011).
18. O. Travnikova, **J.-C. Liu**, A. Lindblad, C. Nicolas, J. Soderstrom, V. Kimberg, F. Gel'mukhanov, and C. Miron, Circularly Polarized X-Rays: Another Probe of Ultrafast Molecular Decay Dynamics, ***Phys. Rev. Lett.* 105**,233001 (2010).
19. **J.-C. Liu**, Y.-P. Sun, C.-K. Wang and F. Gel'mukhanov, Auger effect in the presence of strong x-ray pulses,***Phys. Rev. A* 81**,043412 (2010).
20. Y.-P. Sun, **J.-C. Liu\***, and F. Gel'mukhanov, Propagation of strong x-ray pulse: Pulse compression, stimulated Raman scattering, amplified spontaneous emission, lasing without inversion and four-wave mixing, ***Phys. Rev. A*** **81**, 013812 (2010).
21. S. Gavrilyuk, **J.-C. Liu\***, K. Kamada, H. Ågren, and F. Gel'mukhanov, Optical limiting for microsecond pulses, ***J. Chem. Phys* 130**, 054114 (2009).
22. Y.-P. Sun, **J.-C. Liu\*** and F. Gel'mukhanov, The propagation of a strong x-ray pulse followed by pulse compression, amplified spontaneous emission and lasing without inversion, ***J. Phys. B: At. Mol. Opt. Phys.*** **42**, 201001 (2009).
23. Y.-P. Sun, **J.-C. Liu\*** and F. Gel'mukhanov, Slowdown and compression of strong x-ray free-electron pulse propagating through the Mg vapors, ***EuroPhys. Lett.*** **87**, 64002 (2009).
24. **J.-C. Liu\***, Y. Velkov, Z. Rinkevicius, H. Agren, and F. Gel'mukhanov, Symmetry forbidden X-ray Raman scattering induced by a strong infrared-laser field, ***Phys. Rev. A* 77**, 043405 (2008).
25. **J.-C. Liu\***, V. C. Felicissimo, F. F. Guimaraes, C.-K. Wang, and F. Gel'mukhanov, Coherent control of population and pulse propagation beyond rotating wave approximation, ***J. Phys. B: At. Mol. Opt. Phys.* 41**, 074016 (2008).
26. **J.-C. Liu\***, Y. Velkov, Z. Rinkevicius and F. Gel'mukhanov, Resonant inelastic X-ray Raman scattering induced by Rabi flopping of core holes, ***Chem. Phys. Lett.*** **453**, 117 (2008).
27. Yasumasa Hikosaka, Yasen Velkov, Eiji Shigemasa, Tatsuo Kaneyasu, Yusuke Tamenori, **Ji-Cai Liu**, and Faris Gel'mukhanov, X-ray absorption measured in resonant Auger scattering mode, ***Phys. Rev. Lett.* 101**, 073001 (2008).
28. **Liu J.-C.**, Wang C.-X., Gel'mukhanov F., and Wang C.-K., Dynamics of cooperative emissions in a cascade three-level molecular system driven by an ultrashort laser pulse, ***Chin. Phys. B*****17**, 4211 (2008).
29. **J.-C. Liu\***, C.-K. Wang, and F. Gel'mukhanov, Dynamics of multilevel molecules and pulse propagation beyond rotating wave approximation near two-photon resonance, ***Phys. Rev. A*** **76**, 043422 (2007).
30. **J.-C. Liu\***, C.-K. Wang, and F. Gel'mukhanov, Optical limiting of short laser pulses, ***Phys. Rev. A* 76**, 053804 (2007).
31. C.-K. Wang, **J.-C. Liu**, K. Zhao, Y. -P. Sun, and Y. Luo, Breakdown of optical power limiting and dynamical two-photon absorption for femtosecond laser pulses in molecular medium, ***J. Opt. Soc. Am. B* 24**, 2436 (2007).
32. **刘纪彩**，赵珂，宋玉志，王传奎，级联三能级模型下超短脉冲激光与分子相互作用的动力学研究[Dynamical behavior of ultra-short laser pulse in a cascade three-level molecular system]，***物理学报*55**，1803 (2006).