

## 实验室概况/ Overview of the Laboratory of Optical Physics

光物理实验室最早是经中国科学院组织专家论证并批准成立的部门实验室，于 1994 年 12 月正式对国内外开放，2001 年 11 月按中科院的统一要求更名为中国科学院物理研究所光物理重点实验室。实验室为从事光物理基础研究及应用基础研究的实体，主要研究方向是光与物质相互作用的基础研究，同时开展新材料在光学，尤其是在光子学领域的应用基础研究，即一方面重视光物理本身的研究，另一方面将现代光学的方法和技术引入凝聚态物理和材料科学中去，开拓几种新材料在高技术产业中的可能应用。实验室瞄准国际科学前沿，在激光物理、光子晶体、非线性光学、量子光学、强场物理及超快过程研究等方面开展了在国内外有相当影响的基础和应用研究工作。在激光器件和新型薄膜材料研究上也有较强的力量，能够研制并提供多种超短脉冲激光器件和全固态激光器件，并取得了具有国际先进水平的成果。此外将光学和物理学的方法、手段应用于生物系统也是目前正在发展的重点学科方向。与凝聚态物理与材料科学紧密结合是光物理实验室研究的重要特点。

光物理实验室拥有门类齐全的先进激光系统，如纳秒、皮秒、飞秒脉冲激光器，可调谐激光器，准分子激光器等，以及数字示波器、锁相放大器、Boxcar 积分器、单光子计数设备及工作在红外、可见和紫外波段的各类光谱仪等现代测量仪器，可以开展各类光物理的前沿研究工作。

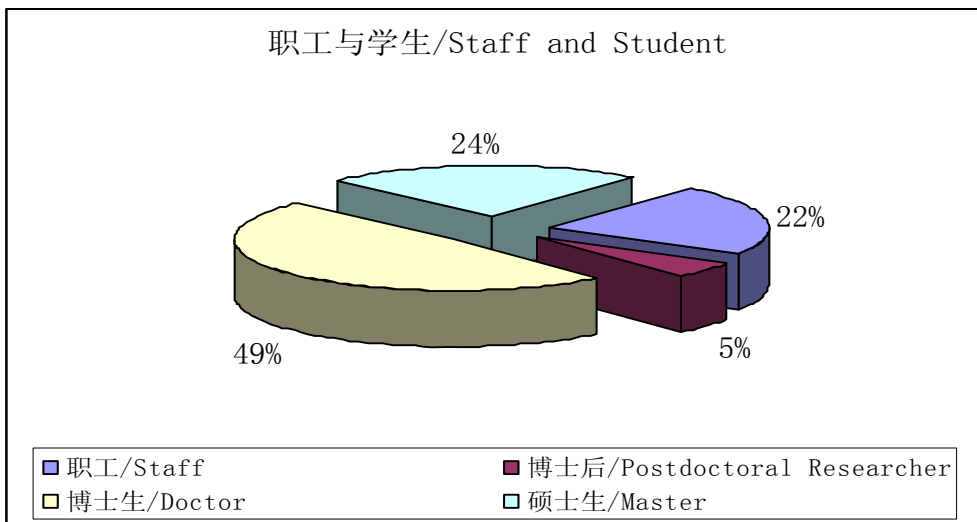
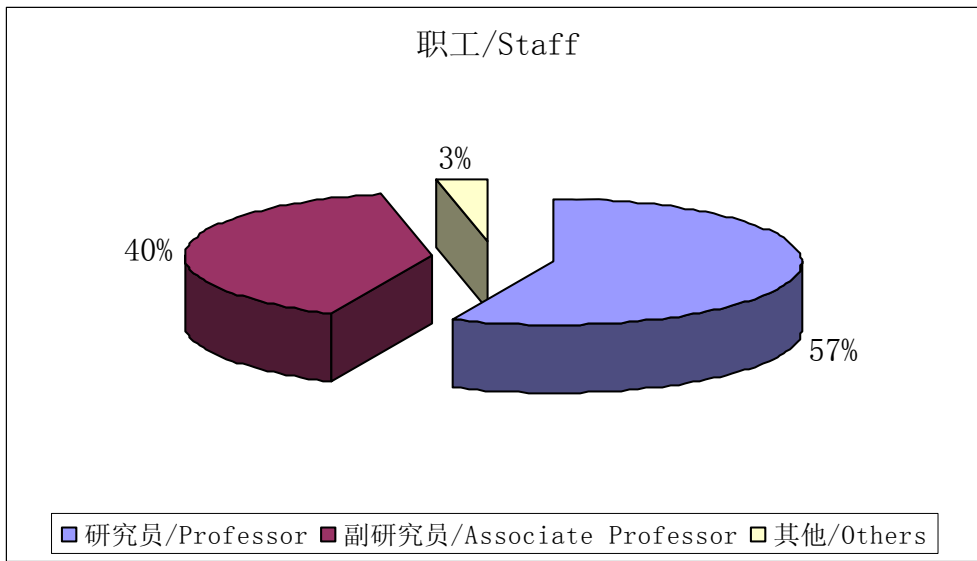
光物理实验室目前拥有三十位研究人员，是一支具有一定综合实力的研究队伍，现为全国光学学科博士、硕士学位点和博士后流动站，有七十多名在读研究生。目前实验室的研究工作大多数已进入国际竞争的前沿，承担多项国家和省部委的重大和重点研究课题。几年来，光物理实验室在光物理及其相关领域的研究中发挥了应有的作用。光物理实验室现与国内外十几个大学和研究所建立了良好的学术合作关系，对国内外科学家提出的优秀研究项目给予资助并开展合作研究。

Optical physics was one of the earliest disciplines established in the Institute of Physics, Chinese Academy of Sciences (CAS). In December 1994 the Laboratory of Optical Physics was authorized as an Open Laboratory of CAS, and then renamed a CAS Key Laboratory in 2001. Its main focus is on the fundamental studies of laser interactions with matter, as well as applied basic research on novel materials in optics and photonics. That is, while emphasizing the physics of optics, at the same time modern optical methods and techniques are applied to condensed matter physics and material science for potential applications of new materials in high-tech industry. Current research topics include pure and applied studies in laser physics, photonic crystals, nonlinear optics, quantum optics, high laser field physics and ultrafast processes. Through persistent efforts the Laboratory is becoming more and more competitive academically, with a considerable number of publications in the major international journals. Important progress has also been achieved in the fabrication of advanced laser devices and thin film materials, and many kinds of ultrashort pulsed lasers and all-solid-state lasers have been developed in-house, reaping in several national awards in science and technology. Meanwhile, the application of optical methods to biological systems has become an increasingly active research field, further demonstrating the close association of optics with condensed matter and material science in the Lab.

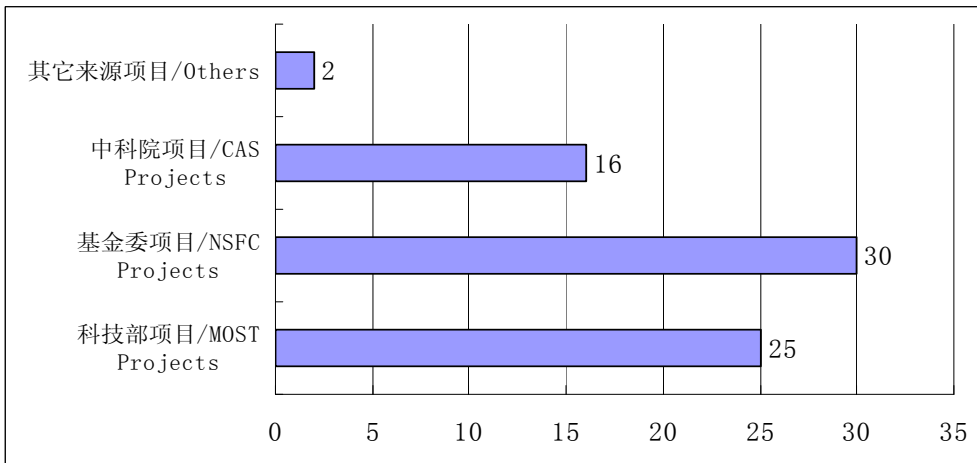
At present we have a whole range of advanced laser systems, such as pulsed lasers with nanosecond, picosecond and femtosecond pulse durations, as well as a tunable ring laser, excimer laser and widely tunable optical parametric amplifier (OPA). Modern detection instruments such as fast oscilloscopes, lock-in amplifiers, boxcars, single-photon detection counters, all types of autocorrelators, and different kinds of spectrometers covering the infrared, visible and ultraviolet regions are also available.

With a total of thirty research and administrative staff and more than seventy graduate students the Laboratory has emerged as a dynamic force at the forefront of research in optics, undertaking many major national programs. Successful collective projects are in progress with over a dozen external research groups both in China and abroad, and the Laboratory will continue to encourage and support such highly fruitful collaboration.

人事概况/General View of Personnel



在研项目概况/General View on Projects under Researching



## 人员结构/Organization

### 实验室主任/Director

张杰 院士 Zhang Jie, Academician

### 实验室副主任/Deputy Directors

魏志义 研究员 Wei Zhi-yi, Professor

李志远 研究员 Li Zhi-yuan, Professor

### 学术秘书/ Academical Secretary

金奎娟 研究员 Jin Kui-juan, Professor

### 研究组长/Research Group Leaders

程丙英 研究员 Cheng Bing-ying, Professor

金奎娟 研究员 Jin Kui-juan, Professor

傅盘铭 研究员 Fu Pan-ming, Professor

张杰 院士 Zhang Jie, Academician

许祖彦 院士 Xu Zu-yan, Academician

魏志义 研究员 Wei Zhi-yi, Professor

### 学术委员会/Academic Committee

#### 名誉主任/ Honour Chairmen

沈元壤 院士 Shen Yuen-Ron, Academician (美国加州大学, University of California, Berkeley)

杨国桢 院士 Yang Guo-zhen, Academician (物理所, Institute of Physics, CAS)

#### 主任/ Chairman

张道中 研究员 Zhang Dao-zhong, Professor (物理所, Institute of Physics, CAS)

#### 副主任/ Deputy Chairmen

龚旗煌 教授 Gong Qi-huang, Professor (北京大学, Peking University)

李师群 教授 Li Shi-qun, Professor (清华大学, Tsinghua University)

#### 委员/Committee Members

夏宇兴 教授 Xia Yu-xing, Professor (上海交通大学, Shanghai Jiao Tong University)

祝世宁 教授 Zhu Shi-ning, Professor (南京大学, Nanjing University)

徐雷 教授 Xu Lei, Professor (复旦大学, Fudan University)

张希成 教授 Zhang Xi-cheng Professor (Rensselaer Polytechnic Institute, USA)

聂玉昕 研究员 Nie Yu-xin, Professor (Institute of Physics, CAS)

王清月 教授 Wang Qing-yue, Professor (天津大学, Tianjin University)

汪河洲 教授 Wang He-zhou, Professor (中山大学, Zhongshan University)

汪力 研究员 Wang Li, Professor (Institute of Physics, CAS)

陈润生 研究员 Chen Run-sheng, Professor (生物物理所, Institute of Biophysics, CAS)

常铁强 研究员 Chang Tie-Qiang, Professor (北京应用物理与计算数学研究所, Beijing Institute of Applied Physics and Computational Mathematics)

明海 教授 Ming Hai, Professor (中国科大, University of Science & Technology of China)

**杰出人才/Intelligent Staff****中国科学院院士/Academician, CAS**

1999 杨国桢 Yang Guozhen  
2003 张杰 Zhang Jie

**中国工程院院士/Academician, CAE**

2001 许祖彦 Xu Zuyan

**国家杰出青年基金获得者/National Science Fund for Distinguished Young Scholars**

1997 李晓峰 Li Xiaofeng  
1998 张杰 Zhang Jie  
2000 王鹏业 Wang Pengye  
2002 魏志义 Wei Zhiyi  
2004 盛政明 Sheng Zhengming  
2005 李志远 Li Zhiyuan

**国家海外青年学者合作研究基金获得者/Laureates of the 'Joint Research Fund for Overseas Chinese Young Scholars'**

2000 朱湘东/吕惠宾 Zhu Xiang-dong/Lu Hui-bin  
2001 张希成/张杰 Zhang Xi-cheng/Zhang Jie

**中科院“百人计划”入选者**

1998 张杰 Zhang Jie  
1999 翁羽翔 Weng Yuxiang  
2000 程波林 Cheng Bolin  
2000 盛政明 Sheng Zhengming  
2000 邹炳锁 Zou Binsuo  
2004 李志远 Li Zhiyuan

**国家自然科学基金优秀创新研究群体/National Science Fund for Creative Research Groups**

超强超短激光物理研究/Some forefront of high field physics and ultrafast process (60321003, 2004-2006)

张杰	Zhang Jie	激光等离子体物理、强场物理/Laser plasma, High field physics
魏志义	Wei Zhiyi	超快激光技术/Ultrafast laser technology
汪力	Wang Li	超快激光物理/Ultrafast laser physics
翁羽翔	Weng Yuxiang	超快激光光谱及激光化学/Ultrafast laser spectroscopy and laser chemistry
盛政明	Sheng Zhengming	强场激光物理/High field laser physics
金奎娟	Jin Kuijuan	激光物理理论/Laser physics
鲁欣	Lu Xin	强场激光物理理论模拟、流体力学模型
李玉同	Li Yutong	强场激光物理实验、光物理实验

## 光物理重点实验室人员名录/Name List

## 研究人员/Scientific Staff

程丙英	Cheng Bing-ying	王兵兵	Wang Bing-bing
张道中	Zhang Dao-zhong	姜 谦	Jiang Qian
李志远	Li Zhi-yuan	张 杰	Zhang Jie
郭红莲	Guo Hong-lian	盛政明	Sheng Zheng-ming
金奎娟	Jin Kui-juan	李玉同	Li Yu-tong
杨国桢	Yang Guo-zhen	鲁 欣	Lu Xin
周岳亮	Zhou Yue-liang	董全力	Dong Quan-li
吕惠宾	Lü Hui-bin	许祖彦	Xu Zu-yan
程波林	Cheng Bolin	王桂玲	Wang Gui-ling
何 萌	He Meng	张鸿博	Zhang Hong-bo
傅盘铭	Fu Pan-ming	侯 玮	Hou Wei
吴令安	Wu Ling-an	魏志义	Wei Zhi-yi
汪 力	Wang Li	聂玉昕	Nie Yu-xin
李晓峰	Li Xiao-feng	李德华	Li De-hua

## 技术人员/Technical Staff

冯宝华	Feng Bao-hua	张东香	Zhang Dong-xiang
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## 博士后/Post-doctoral Fellows

赵 昆	Zhao Kun	马燕云	Ma Yan-yun
薄 勇	Bo Yong	郭新军	Guo Xin-jun
彭海波	Peng Hai-bo	张洪艳	Zhang Hong-yan
徐春华	Xu Chun-hua		

## 博士生/Ph. D Students

曹玲柱	Cao Ling-zhu	金 展	Jin Zhan
曹 宁	Cao Ning	李景娟	Li Jing-juan
陈 民	Chen Min	李 昆	Li Kun
陈亚辉	Chen Ya-hui	梁文锡	Liang Wen-xi
仇 杰	Qiu Jie	刘国珍	Liu Guo-zhen
丁 硕	Ding Shuo	刘荣鹃	Liu Rong-juan
窦军红	Dou Jun-hong	刘元好	Liu Yuan-hao
费义艳	Fei Yi-yan	刘运全	Liu Yun-quan
冯 帅	Feng Shuai	吕国伟	Lü Guo-wei
冯志芳	Feng Zhi-fang	马海强	Ma Hai-qiang
耿爱丛	Geng Ai-cong	马士华	Ma Shi-hua
关东仪	Guan Dong-yi	彭钦军	Peng Qin-jun
韩海年	Han Hai-nian	任 承	Ren Cheng
韩 鹏	Han Peng	任 坤	Ren Kun
郝作强	Hao Zuo-qiang	沈 鸿	Shen Hong
黄延红	Huang Yan-hong	盛 艳	Sheng Yan

施雨蕾	Shi Yu-lei	赵嵩卿	Zhao Song-qing
孙 梅	Sun Mei	郑 君	Zheng Jun
孙志辉	Sun Zhi-hui	周庆莉	Zhou Qing-li
陶海华	Tao Hai-hua	左战春	Zuo Zhan-chun
田 洁	Tian Jie	郭 林	Guo Lin
王 鹏	Wang Peng	何民卿	He Min-qing
王素梅	Wang Su-mei	屈 娥	Qu E
王 旭	Wang Xu	翁苏明	Weng Su-ming
王学军	Wang Xue-jun	奚婷婷	Xi Ting-ting
武慧春	Wu Hui-chun	邢 杰	Xing Jie
徐 慧	Xu Hui	熊志刚	Xiong Zhi-gang
徐妙华	Xu Miao-hua	张 喆	Zhang Zhe
徐新龙	Xu Xin-long	赵 静	Zhao Jing
严 伟	Yan Wei	赵 环	Zhao Huan
杨晓冬	Yang Xiao-dong	赵丽明	Zhao Li-ming
翟艳花	Zhai Yan-hua	朱江峰	Zhu Jiang-feng
张 玲	Zang Ling	Muhanmmad Abbas Bari	

## 硕士生/Master Students

陈 琢	Chen Zhuo	宁廷银	Ning Ting-yin
崔前进	Cui Qian-jin	牛金艳	Niu Jin-yan
董晓刚	Dong Xiao-gang	施玉显	Shi Yu-xian
杜仕峰	Du Shi-feng	孙毅民	Sun Yi-min
冯 辉	Feng Hui	王首钧	Wang Shou-jun
符汪洋	Fu Wang-yang	温 娟	Wen Juan
胡春莲	Hu Chun-lian	言俊杰	Yan Jun-jie
华一磊	Hua Yi-lei	杨 芳	Yang Fang
李 春	Li Chun	张 炜	Zhang Hui
李江艳	Li Jiang-yan	张 翼	Zhang Yi
刘 峰	Liu Feng	赵建领	Zhao Jian-ling
刘 霞	Liu Xia	赵研英	Zhao Yan-ying
刘娅钊	Liu Ya-zhao	周 勇	Zhou Yong
刘 晔	Liu Ye	钟 欣	Zhong Xin
陆 珩	Lu Heng	朱鹏飞	Zhu Peng-fei
鲁远甫	Lu Yuan-pu	宗 楠	Zong Nan

## 承担课题/ Projects under Researching

序号	任务来源	课题名称	负责人	起止时间
1	863 项目	对混合“快点火”方案的初步研究/高能电子传输的 Fokker-Planck 模拟和混合粒子流体模拟	盛政明	2001.01.01-2006.03.01
2	863 项目	对实现原子内壳层粒子反转的探索	张 杰	2001.01.01-2006.03.31
3	863 项目	超热电子的能量分布及传输过程的研究	张 杰	2001.01.01-2006.03.31
4	863 项目	新型深紫外非线性光学晶体材料和紫外、深紫外全固态激光器	许祖彦	2003.09.01-2005.12.30
5	863 项目	基于皮秒玻璃激光与飞秒掺钛蓝宝石激光高精度同步技术的新型多波长种子光源研究	魏志义	2003.10.01-2006.03.01
6	863 项目	第二代高温超导带材实用化技术研究	周岳亮	2004.11.01-2006.03.01
7	863 项目	大功率瓦级全固态红、蓝激光器产业化技术	李瑞宁	2002.07.01-2005.12.30
8	863 项目	新型紫外倍频晶体 CLBO 及实用化技术研究	王桂玲	2005.01.01-2005.12.30
9	863 项目	全固态绿激光微创治疗 BPH*设备的研制与应用研究	薄 勇	2005.07.01-2006.06.30
10	973 子项目	非周期光子带隙材料的物理特性研究	张道中	2002.04.01-2007.03.31
11	973 子项目	远程光纤中的量子密钥分配	吴令安	2002.04.01-2007.03.31
12	973 子项目	光子带隙材料缺陷态的物理特征	程丙英	2002.04.01-2007.03.31
13	973 子项目	超强超短激光与物质的高度非线性相互作用	李晓峰	2002.09.01-2006.03.01
14	973 子项目	超强超短激光的质量提高和发展中的关键科学问题	魏志义	2002.09.01-2006.03.01
15	973 子项目	超强超短激光驱动的超短波长相干辐射	张 杰	2002.09.01-2006.03.01
16	973 子项目	超短超强激光与物质的高度非线性相互作用	盛政明	2002.09.01-2006.03.01
17	973 子项目	光电功能材料的表征和应用前景评估	许祖彦	2004.09.01-2009.08.31
18	973 子项目	准周期和分形结构实现负折射介质的研究	李志远	2004.09.30-2006.09.30
19	973 子项目	薄膜异质结光电功能材料的制备科学、功能机理和量子过程	陈正豪	2004.10.01-2009.10.31
20	973 子项目	基因网络中蛋白质相互作用的动力学	张道中	2005.06.01-2008.08.31
21	科技部科技平台	基于量子物理的光学时间频率标准体系研究	魏志义	2005.01.01-2007.12.31
22	国家其他任务	激光等离子体通道重点基金	张 杰	2003.06.01-2006.06.01
23	国家其他任务	纳米薄膜物相组成和结构--掠射式 X 射线衍射分析法	聂玉昕	2004.05.01-2006.03.01
24	国家其他任务	纳米材料表面形貌测量方法标准	聂玉昕	2004.05.01-2006.03.01
25	国家其他任务	防化所合同项目	盛政明	2005.01.01-2006.03.01

26	基金面上项目	新型 Nd,Cr:YAG 全固态亚纳秒级自锁模激光特性研究	冯宝华	2003.01.01-2005.12.31
27	基金面上项目	用多体理论从头计算分子线的量子传输性质	金奎娟	2003.01.01-2006.03.01
28	基金面上项目	钛酸钡薄膜及其金属纳米薄膜的制备和微结构与性能研究	陈正豪	2003.01.01-2006.03.01
29	基金面上项目	双光镊系统研究微管聚合及解聚机理	张道中	2004.01.01-2006.12.31
30	基金面上项目	光通信波段的二维光子晶体及其器件	张道中	2004.01.01-2006.12.31
31	基金面上项目	高速宽带可调制铁电薄膜微波器件的研制	程波林	2004.01.01-2006.12.31
32	基金面上项目	用共振四波混频研究超快过程及原子相干性	傅盘铭	2004.01.01-2006.12.31
33	基金面上项目	台面型类镍铌、钼 X 射线激光的实验研究	鲁欣	2004.01.01-2006.12.31
34	基金面上项目	飞秒激光脉冲和液体相互作用实验和理论研究	李玉同	2004.01.01-2006.12.31
35	基金面上项目	吸积盘辐射对周围星际物质的光离化作用	张杰	2004.01.01-2006.12.31
36	基金面上项目	内腔泵浦高效率飞秒光学参量振荡器的研究	魏志义	2004.01.01-2006.12.31
37	基金面上项目	传递矩阵方法设计光子晶体集成电路中的功能元件及其实验制作	李志远	2005.01.01-2007.12.31
38	基金面上项目	非线性准晶光子晶体中频率转换的实验研究	程丙英	2005.01.01-2007.12.31
39	基金面上项目	有机非线性光子晶体超快速光开关研究	张道中	2005.01.01-2007.12.31
40	基金面上项目	光反射差法探测原子尺度控制氧化物薄膜生长机理研究	吕惠宾	2005.01.01-2007.12.31
41	基金面上项目	原子在强激光场中的相对论效应及重碰引起的强场效应	王兵兵	2005.01.01-2007.12.31
42	基金面上项目	基于高信噪比飞秒脉冲强激光与固体靶相互作用产生硬 X 射线源的研究	张杰	2005.01.01-2007.12.31
43	基金面上项目	平板靶等离子体 X 射线激光的二维流体动力学研究	李英俊 张杰	2005.01.01-2007.12.31
44	基金面上项目	强激光与稠密等离子体相互作用的 Fokker-Planck 动力学研究	盛政明	2005.01.01-2007.12.31
45	基金面上项目	飞秒强激光产生的电离通道中的超连续辐射的机理研究	鲁欣	2005.01.01-2007.12.31
46	基金仪器研制专项	产生超宽超稳频率梳的飞秒激光器的研制	魏志义	2003.01.01-2006.03.01
47	基金重大项目	太赫兹辐射的产生、探测及在光谱分析和成像中的应用	张杰	2004.01.01-2007.12.31
48	基金重大项目	新一代光频标物理及技术的基础研究	魏志义	2004.01.01-2007.12.31
49	基金重大项目	新型功能晶体的特性表征和应用前景评估	王桂玲	2005.03.01-2010.02.28
50	基金重点项目	磁、铁电、超导异质结构的物理研究	吕惠宾	2004.01.01-2007.12.31
51	基金重点项目	惯性约束核聚变“快点火”方案中关键物理问题理论研究	盛政明	2004.01.01-2007.12.31
52	基金重点项目	光参量准单光子放大技术及其在生命科学、遥感测量相关领域的应用	翁羽翔 冯宝华	2005.01.01-2008.12.31



53	杰出青年基金	国家杰出青年基金-魏志义	魏志义	2003.01.01-2006.12.31
54	杰出青年基金	国家杰出青年基金-盛政明	盛政明	2005.01.01-2008.12.31
55	创新研究群体基金	超短超强激光科学的若干前沿问题	张 杰	2004.01.01-2006.12.31
56	院创新方向性项目	深紫外非线性光学晶体及其器件研究	许祖彦	2003.09.01-2006.06.30
57	院创新方向性项目	某些天体物理过程的实验室模拟研究	张 杰	2003.12.01-2006.03.01
58	院创新方向性项目	超强超短激光物理实验研究	张 杰	2004.03.01-2005.12.31
59	院创新方向性项目	阿秒激光脉冲技术与物理	魏志义	2004.03.01-2007.12.31
60	院创新方向性项目	超快量子光学研究	张 杰	2005.01.01-2007.01.01
61	院创新方向性项目	光反射差法及其用于薄膜生长机理的研究	杨国楨	2005.01.01-2007.12.31
62	院创新国际合作项目	中日韩超短超强激光发展与应用合作研究	张 杰	2005.06.01-2006.06.30
63	院创新其他项目	新型电磁结材料及特性研究	张道中	2004.01.01-2006.12.31
64	院创新其他项目	用光反射差法原位实时探测与监控薄膜层状外延生长及其在生物研究中的应用	吕惠宾	2004.01.01-2006.12.31
65	院其他任务	院国家杰出青年基金匹配-李晓峰	李晓峰	2001.01.01-2006.03.01
66	院其他任务	CXJJ-107-程波林	程波林	2003.10.01-2006.12.31
67	院其他任务	200TW 台面飞秒超强钛宝石激光装置研制	魏志义	2004.01.01-2006.03.01
68	院其他任务	百人计划-李志远	李志远	2004.01.01-2007.12.30
69	院其他任务	CXJJ-113-张杰	张 杰	2004.01.01-2007.12.31
70	院其他任务	院优秀博士论文专项-李志远	李志远	2005.01.01-2007.01.01
71	院仪器研制	紫外激光倍频技术的研发	许祖彦	2005.01.01-2006.12.31
72	技术合同项目	电子磁谱仪和角分布仪研制	李玉同	2004.07.01-2005.12.31
73	所仪器改造项目	InGaAs 单光子探测系统研制	吴令安	2005.08.01-2007.08.31

## 仪器设备/Facilities

### 一、激光器设备 (Lasers)

#### 1. 飞秒激光器 (Femtosecond Lasers)

性能参数 Specifications	钛宝石激光振荡器 I Ti:sapphire Oscillator I	钛宝石激光振荡器 II Ti:sapphire Oscillator II	钛宝石激光振荡器 III Ti:sapphire Oscillator III
生产厂家 Manufacturer	美国 Spectra-Physics	本室研制 Home-made	本室研制 Home-made
型号 Model	Tsunami		
输出波长 Output Wavelength	750 ~ 850nm	750 ~ 850nm	600~ 1000nm
平均功率 Average Power	1W (790nm)	1W (790nm)	400mW
脉冲宽度 Pulse width	80 ~ 120fs	~ 30fs	5~ 8fs
重复频率 Repetition Rate	82MHz	82MHz	100~300MHz
联系部门 Contact Department	技术组	技术组或 L07 组	L07 组

性能参数 Specifications	钛宝石激光放大器 I Ti:sapphire Amplifier I	钛宝石激光放大器 II Ti:sapphire Amplifier II	钛宝石激光放大器 III Ti:sapphire Amplifier III
生产厂家 Manufacturer	美国 Spectra-Physics	奥地利 Femtolasers Inc	本室研制 Home-made
型号 Model	TSA-10	FemtoPower-Pro	极光 II (Xlite II)
输出波长 Output Wavelength	790nm	~790nm	790nm
单脉冲能量 Pulse energy	5mJ	0.8mJ	640mJ
脉冲宽度 Pulse width	200fs	~ 25fs(自加压缩后 5fs)	30fs
重复频率 Repetition Rate	10Hz	1kHz	10Hz (20TW)
联系部门 Contact Department	技术组	L07 组	L05 或 L07 组

性能参数 Specifications	飞秒镁橄榄石激光振荡器 femtosecond Cr:forsterite laser	同步飞秒钛宝石激光器 Synchronized fs Ti:sapphire Laser
生产厂家 Manufacturer	本室研制 Home-made	本室研制 Home-made
型号 Model		
输出波长 Output Wavelength	1250 ~1350nm	750~ 850nm
平均功率 Average Power	150mW (1280nm)	>1W
脉冲宽度 Pulse width	29fs	30~80fs
同步精度 Timing jitter		<1fs
重复频率 Repetition Rate	82MHz	82MHz
联系部门 Contact Department	L07 组	L07 组

## 2. 皮秒激光器 (Picosecond lasers)

性能参数 Specifications	皮秒 Nd:YAG 激光器 psNd:YAG laser	皮秒光参量放大器 ps Optical Parametrial Oscillator
生产厂家 Manufacturer	立陶宛 EKSPLA 公司	本室研制 Home-made
型号 Model	PL2143B	
输出波长 Output Wavelength	1064 532 355nm	430 ~ 2000nm
单脉冲能量 Pulse energy	80 40 20mJ	3mJ
脉冲宽度 Pulse width	25 ps (1064nm)	30ps
重复频率 Repetition Rate	10Hz	10Hz
联系部门 Contact Department	技术组	技术组

## 3. 纳秒激光器 (Nanosecond laser)

性能参数 Specifications	倍频 Nd:YAG 激光器 SHG Nd:YAG laser	倍频 Nd:YAG 激光器 SHG Nd:YAG laser	倍频钕玻璃激光器 SHG Nd:glass laser
生产厂家 Manufacturer	美国 Positive Light	美国 Spectra-Physics	
型号 Model	Evolution 30	Pro-230	Powelite-100
输出波长 Output Wavelength	527nm	532nm	527nm
单脉冲能量 Pulse energy	~20mJ (2W)	~1.4J	100J
脉冲宽度 Pulse width	>100ns	~7ns	~25ns
重复频率 Repetition Rate	1kHz	10Hz	3pph
联系部门 Contact Department	L07 组	L05 或 L07 组	L05 或 L07 组

性能参数 Specifications	准分子激光器 Excimer Laser	Nd:YAG 激光器 Nd:YAG laser	光参量振荡器 OPO
生产厂家 Manufacturer	德国 Lambda Physik	立陶宛 EKSPLA 公司	本室研制 Home-made
型号 Model	LEXTRA200	NL303 型	
输出波长 Output Wavelength	308nm	1064 532 355nm	430 ~ 2000nm
单脉冲能量 Pulse energy	400mJ	500 210 135mJ	10mJ
脉冲宽度 Pulse width	~ 28ns	3 ~ 6 ns (1064nm)	3 ~ 6 ns
重复频率 Repetition Rate	30Hz	10Hz	10Hz
联系部门 Contact Department	技术组	技术组	技术组

## 4. 连续激光器 (CW lasers)

性能参数 Specifications	钛宝石激光器 Ti:sapphire laser	倍频 Nd:YVO <sub>4</sub> 激光器 SHG Nd:YVO <sub>4</sub> laser	倍频 Nd:YVO <sub>4</sub> 激光器 SHG Nd:YVO <sub>4</sub> laser
生产厂家 Manufacturer	美国 Spectra-Physics	美国 Spectra-Physics	美国 Coherent Inc
型号 Model	3900	Millennia X	Verdi 10
输出波长 Output Wavelength	700 ~ 950nm	532nm	532nm
平均功率 Average Power	750mW (790nm)	10W	10W
线宽 Linewidth	< 40GHz		<5MHz
联系部门 Contact Department	技术组	L07 组	L07 组

## 二、分析测试仪器

光栅光谱仪/Spectrometer	型微型光纤光谱仪/Mini-Spectrometer
美国 Acton Research Corporation 公司	美国 Ocean Optics 公司
型号 Model: SpectraPro-500i	型号 Model: HR-2000
波长扫描范围 Scan range: 200 ~ 1400nm	波长测量范围 Measured range: 200 ~ 1100nm
分辨率 Resolution: 0.05nm	分辨率 Resolution: 0.05nm
用于材料透射谱、吸收谱, 光波长测量等	用于光波长测量、荧光测量等
联系部门 Contact Department: 技术组	联系部门 Contact Department: 技术组

FR-103 型自相关仪/Autocorrelator	脉冲干涉自相关仪/Interferometer autocorrelator
美国 Femtochrome Research 公司	本室研制 Home-made
测量波长范围 Wavelength range: 460~900nm	测量波长范围 Wavelength range: 600~1000nm
测量脉宽范围 Measurable range: 50fs	测量脉宽范围 Measurable range: 3fs ~ 100fs
用于高重复频率超短激光脉冲脉宽测量	用于低重复频率超短激光脉冲脉宽测量

信号平均器/Signal average	SPIDER
美国 EG&G 公司	本室研制 Home-made
型号 Model: 4400	
输入信号 Input signal: $\pm 2\text{mV} \sim \pm 5\text{V}$	测量波长范围: Wavelength range: 600~1000nm
门宽选择 Gate : 2ns, 5ns, 10ns, 12ns, 15ns	测量脉宽范围: Measurable range: 3fs ~ 100fs
20ns 到 2ms 连续可选	

SPM100 型近场扫描光学显微镜	DG535 脉冲延时器/Delay generator
美国 RHK 公司	美国 EG&G 公司
扫描范围 Scan range: 30um $\times$ 30um	延时范围 Delay range: 0 ~ 999s
激光源 Laser sources: 465, 488, 514nm	延时通道 Delay Channel: A, B, C, D
工作模式 Modes: 接触和敲打透射模式	延时输出 Delay output: A, B, C, D, AB,
近场探针 Near filed Probe: 悬臂式光纤 Fiber	-AB, CD, -CD
分辨率 Resolution: < 100 nm	分辨率 Resolution: 5ps
联系部门 Contact Department: 技术组	联系部门 Contact Department: 技术组

注: 除开放基金外, 所有仪器设备均为有偿使用

## 获奖情况/Award

### II 型激光分子束外延设备及其应用研究/A new laser molecular beam epitaxy system and it's applications

2005 年北京市科学技术奖一等奖/first prize of Beijing Science and Technology in 2005

主要完成人: 吕惠宾 陈正豪 杨国桢 缪凤英 周岳亮 翟光杰 何 萌 王透迤  
金奎娟 程波林 赵科新 赵崇良 李重茂 袁懋森 冯 稷

Chief Participants: Lü Hui-bin, Chen Zheng-hao, Yang Guo-zhen, Miao Feng-ying, Zhou Yue-liang, Zhai Guang-jie, He Meng, Wang Wei-yi, Jin Kui-juan, Cheng Bo-lin, Zhao Xin-ke, Zhao Chong-liang, Li Zhong-mao, Yuan Mao-sen, Feng Ji

激光分子束外延是二十世纪九十年代才出现的一种新型精密制膜技术,能以原子尺度控制外延生长出其它制膜设备和方法难以制备的高熔点、多元素和复杂层状结构的薄膜、异质结和超晶格材料。是探索开发新材料新器件和进行其相关基础研究的一个平台。光物理实验室的科研人员与技术部人员合作研制成功了我国 II 型激光分子束外延设备。“II 型激光分子束外延设备及其应用研究”获北京市 2005 年科学技术一等奖。



Laser Molecular Beam Epitaxy (laser MBE) appeared in the 1990s and became a promising method for unit-cell by unit-cell epitaxial films, especially for high melting point ceramics and multicomponent solids controlled in atomic scale. A new laser MBE system has been developed by the researchers in the key laboratory of optical physics. “A new laser molecular beam epitaxy system and it's applications” has got the first prize of Beijing Science and Technology in 2005.

### 获奖个人/Award for distinguished scientists

张 杰: 全国先进工作者

Zhang Jie: the National Outstanding Worker's prize

陈正豪: 第二届“中国科学院十大杰出妇女”

Chen Zheng-hao: 2<sup>th</sup> prize for eximious women, CAS

### 获奖研究生 /Award for excellent graduate students

全国百篇优秀博士学位论文奖	倪培根	中科院宝洁优秀博士研究生奖	郭海中
中科院研究生院优秀毕业生	冯志芳	中科院研究生院三好学生标兵	彭钦军
中科院研究生院三好学生	周庆莉	刘元好	盛 艳 黄延红 吕国伟 张 玲 左战春
	郝作强	武慧春	奚婷婷 耿爱丛 王 鹏 彭钦军 宗 楠
	刘 晔	朱鹏飞	温 娟
中科院物理所所长奖学金优秀奖	冯志芳	冯 帅	周庆莉 武慧春 彭钦军
中科院物理所所长奖学金表彰奖	田 洁	黄延红	吕国伟 张 玲 左战春
	徐新龙	郝作强	陈 民 耿爱丛 王 鹏

## 研究报告/Scientific Report

### 光子晶体及其应用/Photonic Crystal & Its Application

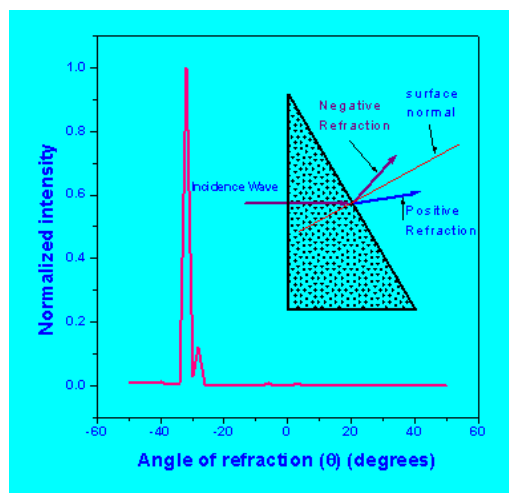
组长: 程丙英

Group Leader: Cheng Bing-ying

成员: 张道中 李志远 郭红莲

Members: Zhang Dao-zhong, Li Zhi-yuan, Guo Hong-lian

- ◆进行了紫外及近红外两维光子晶体各种单元器件的实验研究。
- ◆理论和实验上研究了准晶及其它光子晶体的负折射和近场成像特性。
- ◆进行了超快光子晶体全光开关的实验研究, 获得了迄今为止 25fs 最快的开关速度。
- ◆利用两维准周期非线性光子晶体实现了准连续波的频率转换。
- ◆研究了金属纳米颗粒的表面等离子体共振对几何形状、组分和拓扑结构的依赖关系。
- ◆研究光子晶体滤波器中波导和微腔的耦合, 发现了通道上传/下载滤波器连续可调的一种方法。
- ◆系统研究了微管断裂的机理, 测量了微管断裂的动态过程, 结果表明微管的断裂不是同时发生而是逐步完成的。



首次在近乎均匀结构的十二重准晶中观察到了负折射和非近场成像的效应, 相应的折射率接近于-1, 成像的分辨率为亚波长量级, 相关结果发表在Phys. Rev. Lett., 94, 247402 (2005)上。图为入射角为30时, 在-32方向上观察到的信号强度示意图, 其中插图为例品的结构示意图。

We report a new theoretical and experimental finding that negative refraction can appear in some transparent quasicrystalline photonic structures. The photonic quasicrystals (PQCs) exhibit an effective refractive index close to -1 in a certain frequency window. The index shows small spatial dispersion, consistent with the nearly homogeneous geometry of the quasicrystal. More interestingly, a superlens based on the 2D PQCs can form a non-near-field subwavelength image whose position varies with the source distance.

- ◆Fabricated and characterized various ultraviolet and near infrared two dimensional photonic crystal devices.
- ◆Study continually the negative refraction and imaging properties of quasiperiodic and other photonic crystal structures.
- ◆Demonstrated an ultrafast all-optical photonic crystal switch with a on/off speed of 25 fs, which is a new world record up to now.
- ◆Frequency conversion of continuous wave is realized by using two-dimensional quasiperiodic nonlinear photonic crystal.
- ◆Examine systematically surface-plasmon resonance properties of metallic nanoparticles in relation with the geometric shape, compositions, and topology of the particles and explored potential applications of these particles in chemical and biological sensors and optical coherence tomography.
- ◆Investigate systematically waveguide-cavity coupling in photonic crystal filters and discover a wide-band continuous tunability in photonic crystal channel add/drop filters via simple change of the radius of the building cylinders.
- ◆The mechanism of microtubule cleavage is studied systematically and the dynamic process of cleavage is measured. The results show that the breakup of protofilaments is not simultaneous but step-by-step.

## 激光法低维氧化物材料制备及物性研究/ Manufacturing Low Dimension Oxide Materials by Laser and Studying Their Properties

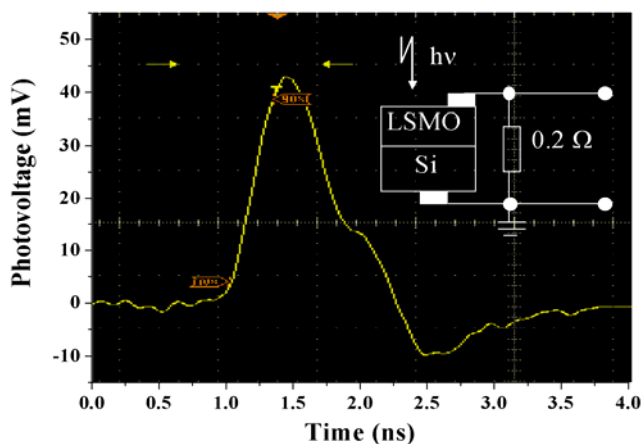
组长: 金奎娟

成员: 杨国桢 吕惠宾 周岳亮 何 萌  
陈正豪 程波林

Group Leader: Jin Kui-juan

Members: Yang Guo-zhen, Lü Hui-bin, Zhou Yue-liang,  
He Meng, Chen Zheng-hao, Cheng Bo-lin

- ◆在钙钛矿氧化物异质结上观测到皮秒光电效应; 建立了理论模型并通过自洽计算, 揭示了该体系自旋极化输运机特性和奇异正磁电阻产生机制。而且我们基于相分离理论研究了巨磁电阻薄膜的输运特性, 发现团簇渗流起着重要作用。
- ◆研究了利用在 PLD 制备过程中加一横向外加电场导致 Ag-BaTiO<sub>3</sub> 复合薄膜的三阶光学非线性的增强效应及其机制, 获得了很好结果; 采用掺杂、复合和多层调制结构等方法优化了 Ba<sub>1-x</sub>Sr<sub>x</sub>TiO<sub>3</sub> (BST)薄膜的介电性能, 对薄膜的低频及高频微波性能进行了测试。



Ultra-fast open-circuit photovoltage with the excitation of a 1064 nm laser pulse on the LSMO/Si p-n junction. The rise time was  $\sim 330$  picoseconds (ps) and the full width at half maximum was  $\sim 580$ ps for the photovoltaic pulse.

- ◆建立了移动式可拆装光反射差法实验装置; 用 PLD 技术研制出高质量 YBCO/CeO<sub>2</sub>/YSZ/CeO<sub>2</sub> 第二代高温超导带材小样, 其工程临界电流密度可达 100—150 A/cm<sup>2</sup>。
- ◆Picosecond ultrafast photoelectric effects have been observed in perovskite oxide heterojunctions. By establishing a theoretical model and carrying out the self-consistent calculation, we have revealed the spin-polarized transport properties and the mechanism causing the unusual positive magnetoresistance in the system. Base on the phase separation scenario, transport properties has been studied in the Mixed-phase Manganites. We find that cluster percolation plays an important role.
- ◆Applying a traverse external electric field during the deposition of PLD, we have studied the composite thin film Ag-BaTiO<sub>3</sub> and found an electric-field-induced enhancement of third-order nonlinear optical effect; We have optimized the permittivity performance of the Ba<sub>1-x</sub>Sr<sub>x</sub>TiO<sub>3</sub> thin films by doping, composing, and multilayer-modulating methods. Furthermore, we have tested the performance of the films in the low- and high-frequency microwave region.
- ◆A set of portable oblique-incidence optical reflectivity difference (OIRD) experimental equipment has been established; The second generation high temperature superconducting strip materials with high quality have been developed using PLD technique and the engineering critical current density has reached 100—150 A/cm<sup>2</sup>.
- ◆In the year of 2005, there are more than 60 papers indexed by SCI, including about 10 papers published in Phys. Rev. B and Appl. Phys. Lett.. In addition, about 10 inventive patents have been applied for. Three invited meeting reports have been given.



## 量子干涉与量子信息/Quantum Interference &amp; Quantum Information

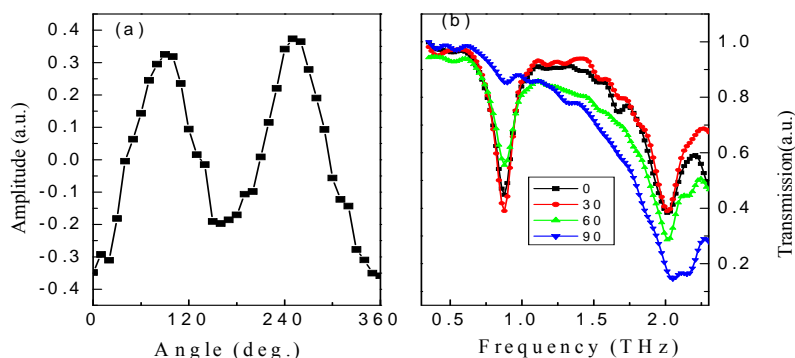
组长: 傅盘铭

Group Leader: Fu Pan-ming

成员: 汪力 吴令安 李晓峰 王兵兵 姜谦

Members: Wang Li, Wu Ling-an, Li Xiao-feng,  
Wang Bing-bing, Jiang Qian

- ◆首次以真正热光源实现双光子关联“鬼”成像和亚波长“鬼”干涉, 表明不需要纠缠态光源既可实现高分辨率成像。
- ◆完成 50km 高比特率光纤量子密钥分发演示系统及单光子探测器的研制。
- ◆研究缀饰原子双光子非简并四波混频中由多普勒效应产生的偏振干涉。
- ◆用 THz 时域光谱技术观察到氨基酸中来自分子间的氢键相互作用的低频集体振动模。
- ◆用 THz 时域光谱技术及泵浦探测方法研究单壁碳纳米管薄膜在 THz 波段的频率响应特性及超快过程。
- ◆提出用原子相干态来提高高次谐波效率的新方法。
- ◆首创基于光子时间随机分布的高稳定真随机数源。



(a) Angular dependence of the transmission of THz peak signal through the SRR sample.

(b) Transmission through the SRR sample as a function of frequency at different polarization orientations (0°, 30°, 60°, and 90°).

- ◆Realized two-photon correlation “ghost” imaging and subwavelength interference for the first time with true thermal light, demonstrating that entangled light is not essential for high resolution imaging.
- ◆Achieved high bit rate quantum key distribution over 50km of fiber with a single photon detector developed in our lab.
- ◆Investigated polarization interference between atoms of different velocities in dressed-atom two-photon resonant nondegenerate four-wave mixing.
- ◆Observed far-infrared collective vibrational modes mediated by intermolecular hydrogen bonds by THz time-domain spectroscopy.
- ◆Studied the THz dielectric response and ultrafast relaxation processes in single-walled carbon nanotube films with THz spectroscopy and pump-probe techniques.
- ◆Proposed new method to enhance high-order harmonic generation conversion efficiency through atomic coherent states.
- ◆Demonstrated the first highly stable true random number generator based on the random time distribution of photons.

## 超强超短激光与物质相互作用/ Ultra-Short Intense Laser Interaction with Matter

组长: 张杰

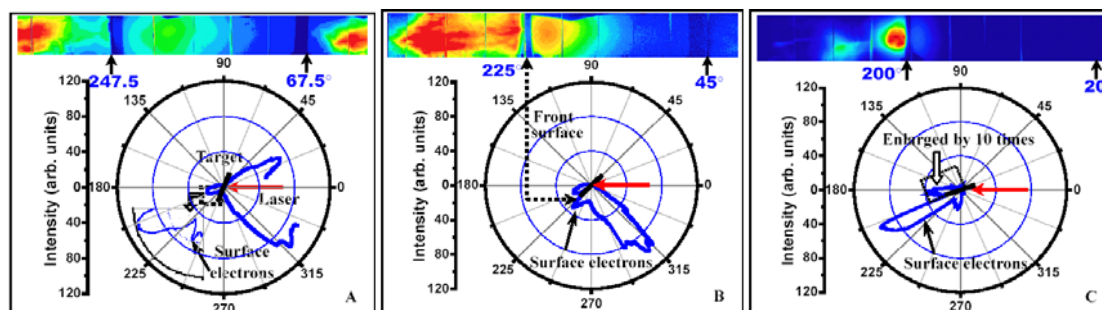
Group Leader: Zhang Jie

成员: 盛政明 李玉同 鲁欣 董全力

Members: Sheng Zheng-ming, Li Yu-tong, Lu Xin, Dong Quan-li.

- ◆ 高能电子在传输中的自组织研究
- ◆ 高能电子角分布和入射角度的关系
- ◆ X 射线激光掠入射泵浦机制研究
- ◆ 天体光电离等离子体和不透明度研究
- ◆ 超强超短激光脉冲产生的超强太赫兹辐射
- ◆ 超强超短激光脉冲在大气中传输物理
- ◆ Self-organization of fast electron transport
- ◆ Angular distributions of hot electrons vs incident angles
- ◆ Grazing incident pumped x-ray lasers
- ◆ Lab Astrophysics about photoionized plasmas and opacity measurements
- ◆ High power THz emission from high intensity laser-plasma interaction
- ◆ Transport of ultrashort intense laser pulse in air

在激光与固体靶作用方面, 首次观测到了超热电子在靶表面的自组织发射, 其产生原因是超热电子自己诱发的表面磁场和电场的约束作用, 这是一种典型的超热电子的自组织现象, 这一结果对于理解快点火实验中锥靶的作用有重要意义。研究了高能质子与薄膜靶厚度、激光脉宽以及超热电子运输的依赖关系。在激光在大气中传输方面, 对等离子体通道中成丝形成过程进行了深入的实验和理论研究, 揭示的背景光场对成丝传播的作用。在理论上提出了产生超强太赫兹辐射的理论, 为获得台面超高功率太赫兹辐射提供了可能性。首次提出了用等离子体密度光栅来对高功率超短脉冲激光进行速度减慢, 脉冲展宽和压缩等操纵的理论, 并通过数值模拟得以证实。在国内首次开展了等离子体波加速电子的实验研究。主办了中德量子工程研讨会和中英 N+N 激光科学研讨会, 在国际上产生重要影响。



In laser-solid interactions, we observe for the first time self-organized collimated electron emission along the target surface. It is produced due to the confinement of quasistatic surface magnetic and electric fields. The result is important for future fast ignition experiments. The dependence of high-energy ions on target thickness, laser pulse duration, and fast electron transport is also investigated. In laser propagation in air, significant theoretical and experimental studies have been conducted to investigate the plasma channel dynamics and laser filament dynamics. The effect of the background laser fields on filaments is clarified. A scheme for terahertz emission from laser interaction with plasmas has been proposed theoretically, which provides the possibility to produce high power table-top THz sources. The plasma density gratings have been proposed to manipulate high power ultrashort laser pulses, such as speed reduction, pulse stretching and compression. We have conducted electron acceleration by use of plasma waves for the first time in China. Finally, we organize the Sino-Germany Workshop in Quantum Engineering and the China-UK N+N Workshop on Laser Science.

## 可调谐全固态激光的研究和应用/ Research & Application of Tunable All Solid State Laser

组长: 许祖彦

Group Leader: Xu Zu-yan

成员: 张鸿博 侯 玮 王桂玲

Members: Zhang Hong-bo, Hou Wei, Wang Gui-ling

- ◆ 红绿蓝 DPL 及激光显示/Diode pumped all-solid-state red-green-blue laser and laser displays
- ◆ 变频 DPL (深紫外—可见—近红外) /Diode pumped all-solid-state lasers with frequency conversion (deep ultraviolet-visible-near infrared)
- ◆ 高功率 DPL 前沿技术/Frontier technique of high-power diode pumped all-solid-state lasers

(1) 红绿蓝黄全固态激光器 (DPL) 及激光显示获突破性进展, 被评为 863 重大成果: QCW669nm 红光 21.7W, 国际首创; QCW440nm 蓝光 6.34W, 国际最高; CW515nm 绿光 4.2W、589nm 黄光 4.6W, 国内领先; 红绿蓝合成白光功率超过 20W, 色域面积国际最大。研制成功 84 和 140 吋背投激光显示样机。

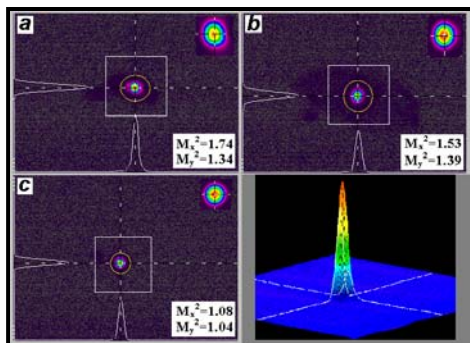


激光全色显示——863“十五”重大成果

(2) 高功率 DPL: CW 热容激光器 2277W, 国际先进; QCW532nm 绿光 160W,  $M^2 \sim 10$ , 国际先进; 首次实现高光束质量相干合成。

(3) 研制成功全固态红外—深紫外宽调谐激光器: 770~960nm 光参量激光器最大输出功率 18W, 国际最高。ns 钛宝石激光器经二和四倍频, 获得紫外—深紫外输出, 深紫外调谐 175~212nm, 最大输出 2.2mW, 国际首创; 首次实现锥形耦合可见波段调谐聚合物光纤激光器, 转换效率 23%。

(4) 评估了 KBBF 深紫外特性, 0.65mm 厚晶体倍频效率可达 4.4%, 国际最高; 用自制的高功率 ps 355nm 激光器, KBBF 倍频 177.3nm 输出 1.5mW, 国际领先; 重新测定了 CBO 晶体的倍频系数, 纠正了国际上有关 CBO 倍频系数的混乱状况。



全固态激光相干合成技术

(1) Red-green-blue and yellow DPL and full color laser displays—Major achievement of 863 Project. The output of QCW 669nm red reached 21.7W for the first time; the outputs of 6.34W, 4.2W and 4.6W were obtained for QCW 440nm blue, CW 515nm green and CW 589nm yellow, respectively. The color-balanced power was 20W of white light with maximum color-gamut. The rear-projection laser displays were developed in 84 and 140 inch, respectively.

(2) High power DPL: 2277W CW heat capacity laser at 1064nm was developed for the first time; 160W CW 532nm green with  $M^2 \sim 10$  was reached advanced international level. The coherent combining with high beam quality was demonstrated for the first time.

(3) IR—DUV tunable laser: 770-960nm OPO output of 18W was obtained for the first time; The second and fourth harmonic generation of a home-made ns Ti:S laser was investigated with DUV tunable range from 175-212nm for the first time. A visible polymer tunable fiber laser was also developed with an efficiency of 23%.

(4) DUV characterization of KBBF crystal was evaluated, SHG efficiency was up to 4.4% in a thin KBBF of 0.65 mm; Using a home-made ps 355nm laser, SHG output of 1.5mW at 177.3nm was reached advanced international level. We have corrected nonlinear coefficient of CBO crystal.

## 超短脉冲激光与量子频标物理/ Ultrafast Laser Pulse &amp; Frequency Metrology

组长: 魏志义

Group Leader: Wei Zhi-yi

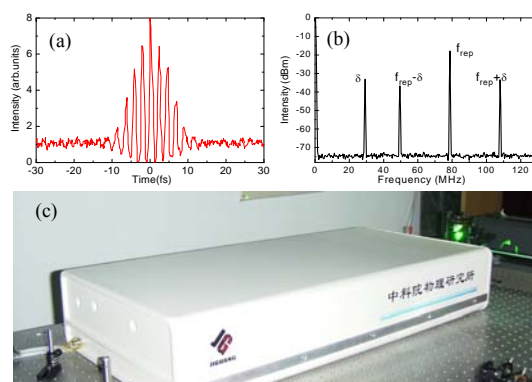
成员: 聂玉昕 李德华 沈乃澍

Members: Nie Yu-Xin, Li De-hua, Shen Nai-cheng

开展了 200TW 级超强飞秒激光装置的设计与建设, 已完成所有单元系统, 发明了克服自发辐射的一种实用新技术, 合作建成 100J 的高能量泵浦激光; 采用独特的结构研制成功直接输出脉宽 7.5fs、重复频率 170MHz 的超短脉冲激光器; 通过中空光纤展宽光谱及啁啾镜脉冲压缩技术, 将 kHz 重复频率的放大激光脉冲压缩到 5.1fs; 直接产生了覆盖 550nm~1050nm 波段的超连续谱, 在国际上首次用 1030nm 激光泵浦获得了锁模镁橄榄石激光, 得到 29fs 的 1285nm 波长激光; 实现了皮秒激光与飞秒激光的高精度主动同步, 经和频得到了 460nm 的飞秒脉冲, 开拓了扩展飞秒激光波长的一种全新技术; 建成综合性能指标全面领先国际水平的被动同步飞秒钛宝石激光; 首次在国际上得到 912nm 的锁模 Nd:GdVO<sub>4</sub> 激光及功率大于 900mW 的 916nm 波长 Nd:LuVO<sub>4</sub> 激光; 完成“纳米材料表面形貌测量方法标准——光学干涉显微镜法”(草稿)的国家标准, 并已上报国家纳米中心。

A 200 TW Ti:sapphire laser facility was designed and a novel technique for eliminating ASE was invented. By collaboration, we also established a 100J Nd:glass laser at 527nm for pump the TW laser. Laser pulse as short as 7.5fs was directly generated from a special design Ti:sapphire oscillator at 176MHz repetition rate. By using a hollow fiber to extend the laser spectrum and chirp mirrors to compensate the dispersion, we obtained 5.1fs laser pulse at energy of 400microjoule and repetition rate of 1kHz. Ultra broaden spectrum of covering from

550~1050nm was generated from the Ti:sapphire laser with chirped mirror. For the first time we realized the mode-locking Cr:forsterite laser pumped with 1030nm laser, the typical pulse duration is 29fs at wavelength of 1285nm. Actively synchronization between picosecond laser and femtosecond laser was developed with low timing jitter, femtosecond laser pulse at 460nm wavelength was generated by sum frequency the synchronized two lasers, which opened a novel way for generating new femtosecond laser wavelength. A passively synchronized femtosecond Ti:sapphire laser with improved technology was demonstrated, the specifications are superior to previous reports. Diode laser pumped mode-locking Nd:GdVO<sub>4</sub> at 912nm and CW Nd:LuVO<sub>4</sub> laser at 916nm with 900mW power were established for first time in the world. In additional, a new National Standard on Measurement technology for surface shape of nano-material---Optical interference microscopy (draft) has been submitted to the Center of National Nanoscience.



(a)所研制钛宝石激光振荡器直接输出的 7.5fs 脉冲的干涉自相关曲线, (b)被动同步飞秒激光两路输出的拍频信号谱, (c)被动同步飞秒激光器照片。

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## 学位论文/Dissertations

### 1. 博士学位论文

- [1] 王兆华, 超短超强激光脉冲测量诊断的研究; 导师: 魏志义 张杰
- [2] 彭晓昱, 超短脉冲激光与微滴靶的相互作用研究; 导师: 张杰
- [3] 刘春香, 双光镊系统的优化及其在生物学中的应用; 导师: 张道中
- [4] 韩守振, 二维非晶光子材料及平板光子晶体的研究; 导师: 张道中
- [5] 马博琴, 二维非线性光子晶体的研究; 导师: 张道中
- [6] 张 辉, YVO<sub>4</sub>—KTP 环形激光器碘吸收三次谐波稳频的研究; 导师: 聂玉昕
- [7] 杨玉平, 太赫兹(THz)近场探测的相关研究; 导师: 汪力
- [8] 相文峰, 硅基沉积高 K 氧化物薄膜材料的制备与性质研究; 导师: 陈正豪
- [9] 郭海中, 钙钛矿氧化物材料的 LMBE 制备与物性研究; 导师: 陈正豪
- [10] 刘丽峰, 钙钛矿氧化物薄膜、异质结构的制备与电学、磁学性质表征; 导师: 陈正豪
- [11] 刘 震, 高温超导氧化物薄膜制备与研究; 导师: 周岳亮
- [12] 王守宇, 用于可调微波器件的 Ba<sub>x</sub>Sr<sub>1-x</sub>TiO<sub>3</sub> 薄膜的制备与物性研究; 导师: 程波林
- [13] 张秋琳, LD 泵浦 GaAs 被动调 Q Yb:YAG 激光器及自调 Q 自锁模 Nd,Cr:YAG 激光器;  
导师: 张治国、冯宝华
- [14] 姚爱云, 大功率全固态连续波红光激光器的研究; 导师: 许祖彦
- [15] 李惠青, 高功率全固态光参量振荡器理论与实验研究; 导师: 许祖彦
- [16] 孙志培, 脉冲全固态激光技术研究; 导师: 许祖彦

### 2. 硕士学位论文

- [1] 季玲玲, 准相位匹配晶体参量耦合过程制备光量子纠缠态; 导师: 吴令安
- [2] 侯岩雪, 光折变晶体的非经典效应与光场的量子统计性质; 导师: 吴令安
- [3] 王 霆, 准相位匹配非线性光子晶体的研究; 导师: 程丙英
- [4] 张 达, “鬼”成像与相干性; 导师: 吴令安

## 1. Dissertation for Doctoral Degree

- [1] Wang Zhaohua, **The measurement of ultra-short and ultra-intensity laser pulses**; Supervisor: Wei Zhiyi, Zhang Jie
- [2] Peng Xiaoyu, **Investigations on the Interaction between Ultrashort Laser Pulses and Micro Droplets**; Supervisor: Zhang Jie
- [3] Liu Chunxiang, **Optimization of optical tweezers system and its applications in biology**; Supervisor: Zhang Daozhong
- [4] Han Shouzhen, **Researches on two-dimensional (2D) amorphous photonic materials and photonic crystal slabs**; Supervisor: Zhang Daozhong
- [5] Ma Boqin, **Researches on two-dimensional nonlinear photonic crystals**; Supervisor: Zhang Daozhong
- [6] Zhang Hui, **The Research On The Third Harmonious Frequency Stabilization With I2 Absorption In The Ring YVO4—KTP Laser**; Supervisor: Nie Yuxin
- [7] Yang Yuping, **Study of THz near-field detection**; Supervisor: Wang Li
- [8] Xiang Wenfeng, **Preparation and Characterization of Si-based High-K Oxide Thin Films**; Supervisor: Chen Zhenghao
- [9] Guo Haizhong, **Fabrication and physical investigation of perovskite oxide materials prepared by laser molecular-beam epitaxy**; Supervisor: Chen Zhenghao
- [10] Liu Lifeng, **The Growth, Characterization, Physical Properties of Perovskite Thin Films and Heterostructures**; Supervisor: Chen Zhenghao
- [11] Liu Zhen, **Study on the fabrication of large area double-sided YBCO High Temperature Superconducting Thin Films and Tapes**; Supervisor: Zhou Yueliang
- [12] Wang Shouyu, **Fabrication and Basic Physical Properties of Ba<sub>1-x</sub>Sr<sub>x</sub>TiO<sub>3</sub> Thin Films for Tunable Microwave Devices**; Supervisor: Cheng Bolin
- [13] Zhang Qiulin, **LD pumped GaAs Q-switched Yb:YAG laser and self-Q-switched mode-locked Nd,Cr:YAG laser**; Supervisor: Zhang Zhiguo, Feng Baohua
- [14] Yao Aiyun, **The research of high power all-solid-state CW red laser**; Supervisor: Xu Zuyan
- [15] Li Huiqing, **High Power All-solid-state Optical Parametric Oscillator**; Supervisor: Xu Zuyan
- [16] Sun Zhipei, **Study on Pulsed All-solid-state laser**; Supervisor: Xu Zuyan

## 2. Dissertation for Master Degree

- [1] Ji Lingling, **prepare two-photon entangled states through a cascaded nonlinear optical process in a quasiperiodic optical superlattice**; Supervisor: Wu Lingan
- [2] Hou Yanxue, **Nonclassical effects in photorefractive crystal and quantum statistical properties of light**; Supervisor: Wu Lingan
- [3] Wang Ting, **Research on quasi-phase-matching nonlinear photonic crystal**; Supervisor: Cheng Bingying
- [4] Zhang Da, **Ghost image and coherence**; Supervisor: Wu Lingan

## 主办国际会议/ International Conferences Sponsored by the Laboratory

[1] 中德量子工程研讨会; 2005-11-23; 北京

会议的中方主席是北京应用物理与计算数学研究所的贺贤土院士和中科院物理所的张杰院士，德方主席是德国汉诺威大学 Wolfgang Ertmer 教授和柏林自由大学的 Ludger Woeste 教授。德国代表包括马普学会量子光学研究所所长、德国著名物理学家 Herbert Walther 教授、德国乌尔姆大学 Wolfgang Schleich 教授等 14 位德国和奥地利物理学家，中方代表包括国家自然科学基金委员会王乃彦院士、中科院上海光机所王育竹等 21 位院士和该领域的知名学者。



研讨会的主题包括：超冷量子气体、强关联冷气体、原子分子的量子工程学、原子量子传感器、量子信息、量子加工光子、相位加工激光脉冲、强激光与物质相互作用等。

中德科学中心/ Sponsored by the Sino-German Center for Research Promotion

中科院物理所光物理实验室/ Key Laboratory of Optical Physics, Institute of Physics, Chinese Academy of Sciences

[2] 中英 N+N 激光科学高层研讨会： 2005-12-12；北京

2005 年 12 月 12 日—14 日“中英 N+N 激光科学高层研讨会”在中国科学院物理研究所/北京凝聚态物理国家实验室举行。来自中国和英国的 40 多位科学家和研究者参加了本届会议。

本次研讨会是为了响应 2005 年中英两国领导人会晤时提出的今明两年在我国和英国就若干科学前沿问题召开系列 N+N 高层科学家研讨会的建议，同时推动中英两国高层科学家实质性合作而举行的。本次研讨会邀请了中国和英国激光科学领域的顶级专家 40 多人，英方代表团由英国中心实验室研究理事会（CCLRC）首席科学家 Herry Hutchinson 教授带队，中方由中科院物理研究所张杰院士带队。双方就各自在激光科学最前沿的问题和激光技术的瓶颈问题进行了深入的讨论和交流，研讨会以讨论问题为主，讨论的时间远大于报告的时间。会议的后半部还聚焦在共同感兴趣的问题上特别安排了专题的讨论，并就凝练出的科学问题签署了合作备忘录，为下一步的深入合作奠定了基础。参会代表对本次会议的组织形式、研讨的内容以及对合作的推动作用都表示了高度的认可，会议决定下一届中英 N+N 激光科学高层研讨会在英国举行。

会议期间，与会代表还参观了中国科学院物理研究所的光物理实验室、表面实验室、超导实验室、软物质实验室、电镜实验室和纳米实验室以及北京大学物理学院的重点实验室，了解了物理所和北大在物理学科各个领域的研究进展情况。

这次研讨会在我国举办将对我国的激光科学学术界和我国相关的应用和产业界起到极大的推动作用，同时也为中英两国在激光科学方面建立起了一个很好的高层学术合作平台。本次研讨会的举办得到了中国科学院、国家自然科学基金委员会、英国驻华使馆的大力支持。



中科院物理所光物理重点实验室/ Key Laboratory of Optical Physics, Institute of Physics, Chinese Academy of Sciences



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## 客座人员名单及客座研究课题/Visitors List &amp; Open Subjects

## 客座人员名单/Visitor List

序号	姓名	性别	年龄	专业	职称	工作单位
1	李兆霖	男	64	光学	研究员	中科院物理所
2	张秀兰	女	65	光学	高工	中科院物理所
3	唐永健	男	50	原子分子	研究员	工程物理研究院激光聚变研究中心
4	朱湘东	男	47	物理	教授	美国加州大学戴维斯分校
5	赵志伟	男	43	材料	研究员	上海光机所
6	张希成	男	49	激光物理	教授	美国 Rensselaer Polytechnic Institute
7	陈正豪	女	65	光学	研究员	中科院物理所
8	董碧珍	女	63	光学	研究员	中科院物理所
9	张泽勃	男	64	光学	研究员	中科院物理所
10	俞祖和	男	65	非线性光学	研究员	中科院物理所
11	米辛	女	65	非线性光学	研究员	中科院物理所
12	张治国	男	65	光学	研究员	中科院物理所
13	崔大复	男	65	光学	研究员	中科院物理所
14	徐贵昌	男	68	光学	研究员	中科院物理所
15	李英俊	男	44	光学	教授	中国矿业大学
16	余玮	男	56	光学	研究员	上海光机所
17	吴炜	女	50	光学	副教授	辽宁大学物理系
18	王淑芳	女	30	光学	副教授	河北大学
19	沈乃澄	男	67	激光频率	研究员	北京市中国计量科学研究院
20	陈云琳	女	40	光学	教授	南开大学物理学院光电材料研发中心
21	张首刚	男	39	量子频标	研究员	中科院国家授时中心

## 实验室资助的客座研究课题/Open Subjects

序号	课题名称	负责人	职称	单位	起止时间
1	钨酸盐单晶的受激拉曼散射研究	臧竞存	教授	北京工业大学材料学院	2004.03-2005.03
2	金属纳米结构材料的近场光学性质研究	明海	教授	中国科技大学物理系	2005.04-2006.04
3	单壁碳纳米管超快光谱分析	谢思深	院士	中科院物理所	2005.04-2005.06
4	离子 C <sup>+</sup> 注入形成 Sic 和 PECVD Sic 膜层的激光退火结晶化及应用研究	张国炳	教授	北京大学微电子学研究所	2005.11-2006.12
5	激光和其它辐射探测器及计量仪器	王树铎	研究员	中科院物理所	2005.01-2005.12

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- [1] Negative Refraction and Imaging Using 12-fold-Symmetry Quasicrystals; Feng ZF, Zhang XD, Wang YQ, Li ZY, Cheng BY, Zhang DZ; **Phys. Rev. Lett.**; **94** (2005) 247402.
- [2] Emission of Electromagnetic Pulses from Laser Wakefields through Linear Mode Conversion; Sheng ZM, Kunioki Mima, Zhang J, Heiji Sanuki; **Phys. Rev. Lett.**; **94** (2005) 95003.
- [3] Oxygen vacancy relaxation and domain wall hysteresis motion in Cobalt-doped barium titanate ceramics; Bo-Lin Cheng\*, Tim W. Button, Maurice Gabbay, Gilbert Fantozzi, and Mario Maglione; **J. Am. Chem. Soc.**; **88** (2005) 907.
- [4] Ultrafast all-optical switching in two-dimensional organic photonic crystal; Hu XY, Liu YH, Tian J, Cheng BY, Zhang DZ; **Appl. Phys. Lett.**; **86** (2005) 121102.
- [5] Subpicosecond optical switching in polystyrene opal; Liu YH, Hu XY, Zhang DX, Cheng BY, Zhang DZ, Meng QB; **Appl. Phys. Lett.**; **86** (2005) 151102.
- [6] Quasiphase matched harmonic generation in a two-dimensional octagonal photonic superlattice; Ma BQ, Wang T, Sheng Y, Ni PG, Cheng BY, Zhang DZ; **Appl. Phys. Lett.**; **87** (2005) 251103.
- [7] Picosecond photoelectric characteristic in La<sub>0.7</sub>Sr<sub>0.3</sub>MnO<sub>3</sub>/Si p-n junctions; Hui-Bin Lu\*, Kui-Juan Jin, Yan-Hong Huang, Meng He, Kun Zhao, Bo-Lin Cheng, Zheng-Hao Chen, Yue-Liang Zhou, Sou-Yu Dai, and Guo-Zhen Yang; **Appl. Phys. Lett.**; **86** (2005) 241915.
- [8] High Sensitivity of Positive Magnetoresistance in Low Magnetic Field in Perovskite Oxide p-n Junction; H. B. Lu, S. Y. Dai, Z. H. Chen, Y. L. Zhou, B. L. Cheng, K. J. Jin, L. F. Liu, G. Z. Yang, X. L. Ma, Y. Y. Fei, W. F. Xiang; **Appl. Phys. Lett.**; **86** (2005) 32502.
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