



Introduction of INPAC @ SJTU

Haijun Yang (SJTU)

KIT, Germany, Sept. 6-8, 2017

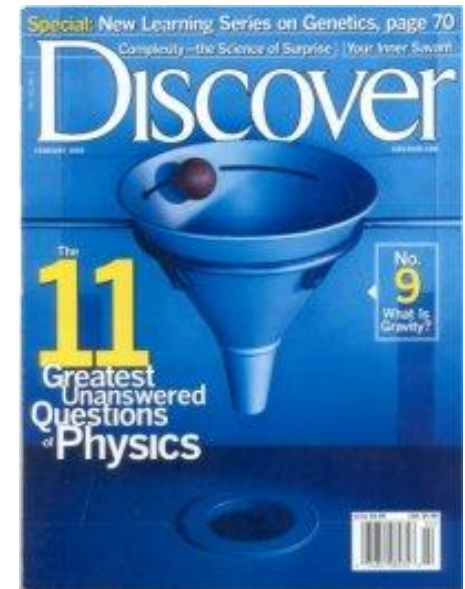


上海交通大學
SHANGHAI JIAO TONG UNIVERSITY

Mission – Quest unanswered questions

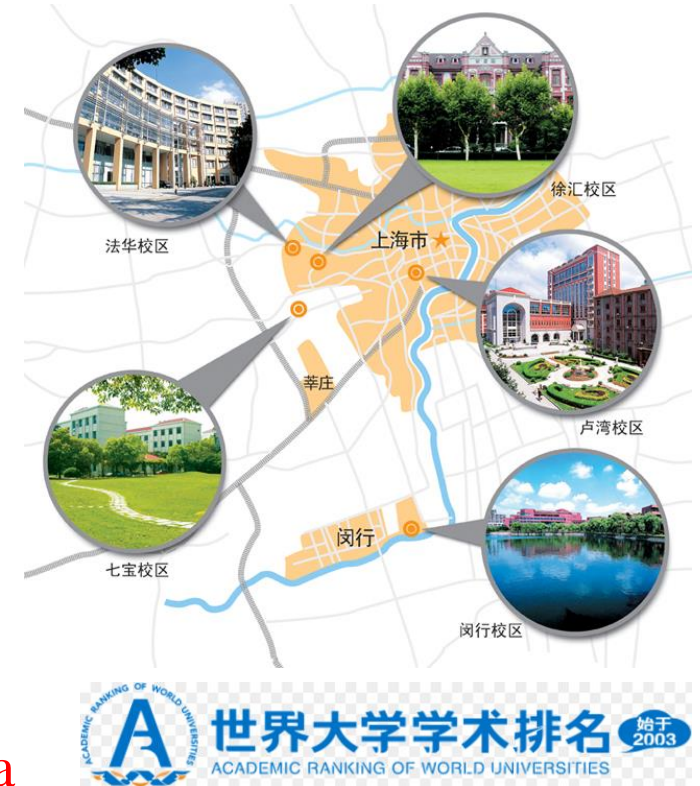
INPAC

- ① **Dark matter and Dark energy**
- ① **High energy collider physics**
- ① **Flavor physics of quarks and leptons**
- ① **Neutrino physics, masses, mixing and cosmological implications**
- ① **Origin of UHE cosmic ray**
- ① **How do elements above Fe form and Physics of light & matter, new state at extreme temperature & density**
- ① **Unification of different interactions**
- ① **Gravity and extra dimensions**
- ① **How did the universe begin. Theory of Everything?**



Shanghai Jiao Tong U. (<http://www.sjtu.edu.cn>)

- SJTU was established in 1896
- SJTU has about 37300 students
 - Undergraduate: ~16200
 - Graduate students: ~21000
 - International students: ~2400
- SJTU faculty: 2835
 - Professors 858,
 - Changjiang Chair Professor 140, NSFC OJI 123
 - Members of CAS: 22, CAE: 24
 - National 1000-Talent (Young) : 106 (143)
- **2010-2016 NSFC Funding: Rank #1 in China**
- **2007-2016 10-year accumulated publications and citations: Rank #2 in China**



2003 - #422
2008 - #168
2015 - #118

School of Physics and Astronomy (<http://www.physics.sjtu.edu.cn>)



- ❖ 1906 Physics Laboratory
- ❖ 1928 Department of Physics
- ❖ 2013 Department of Physics and Astronomy
- ❖ 2017 School of Physics and Astronomy
- Department of Astronomy
- Institute of Nuclear and Particle Physics
- Institute of Theoretical and Interdisciplinary Physics
- Key Laboratory for Laser Plasma, MoE
- Institute of Condensed Matter Physics
- Optical Science and Engineering Research Center
- National Center for Physics Education

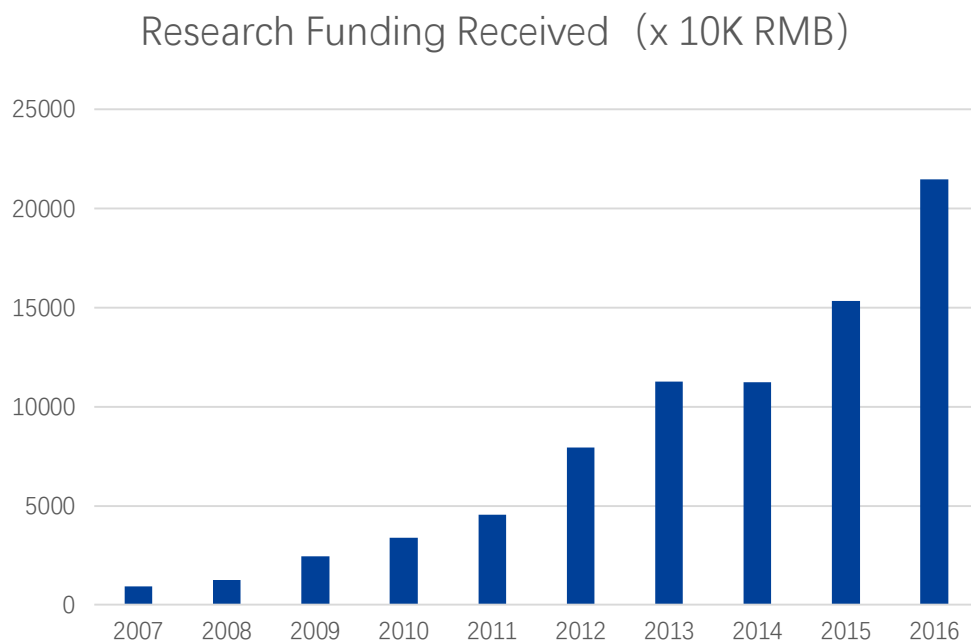
124 Faculty, 62 Professors
54 Associate Professors



School of Physics and Astronomy

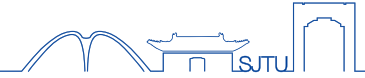


2007 – 2016, Research funding increased by a factor of ~ 20



Year	Funding (x Million RMB)
2007	9.29
2008	12.69
2009	24.38
2010	33.9
2011	45.61
2012	79.27
2013	112.7
2014	112.3
2015	153.3
2016	214.7

INPAC established in 2009



INPAC
(Institute of Nuclear and Particle Physics, Astronomy, and Cosmology)
was founded on
Feb. 24, 2009



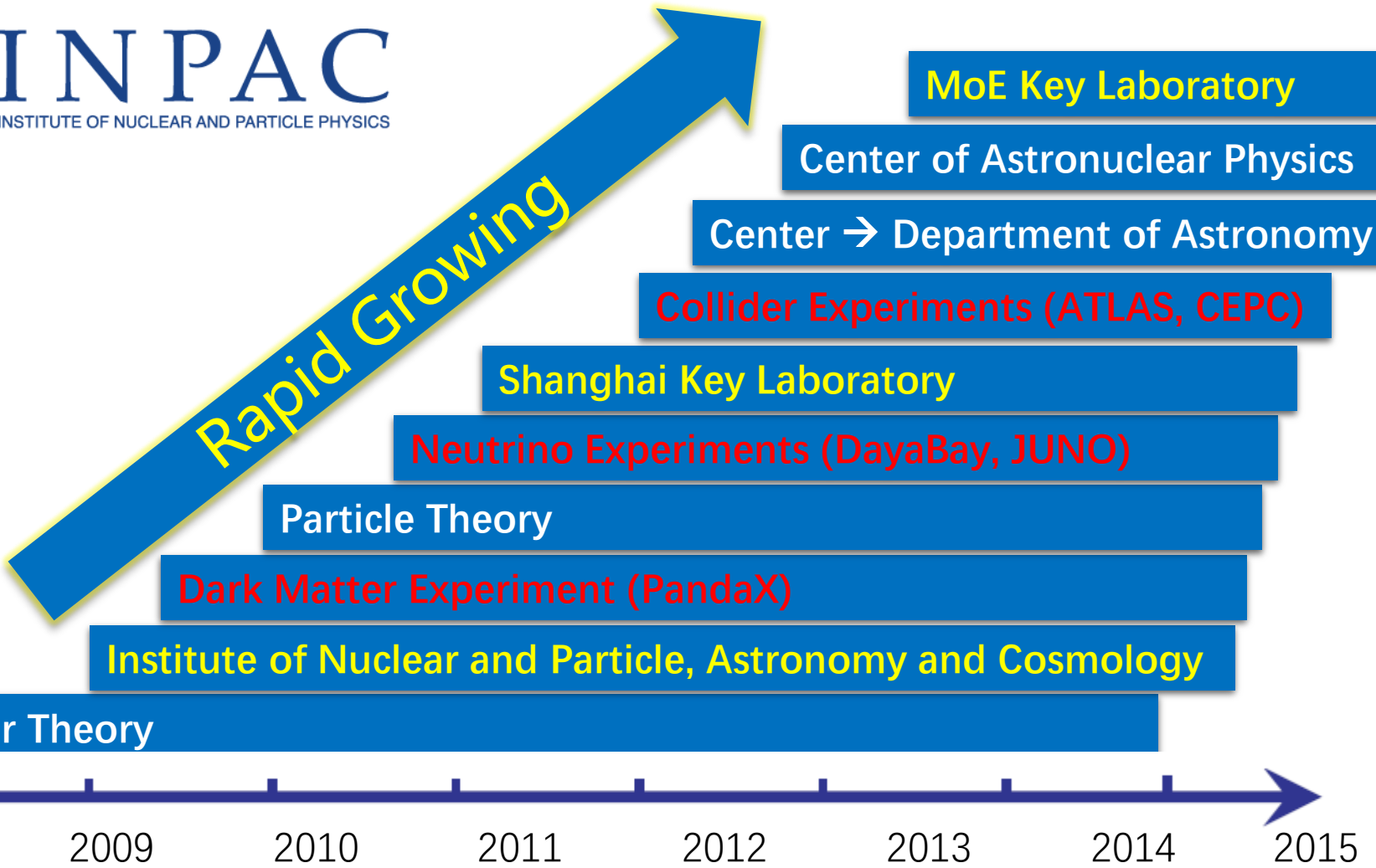
- Theoretical Particle and Nuclear Physics
- Experimental Particle and Nuclear Physics
- Astrophysics, Gravity and Cosmology



Institute of Nuclear and Particle Physics

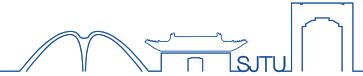


INPAC
INSTITUTE OF NUCLEAR AND PARTICLE PHYSICS



2008 2009 2010 2011 2012 2013 2014 2015

MoE Key Laboratory (2016)

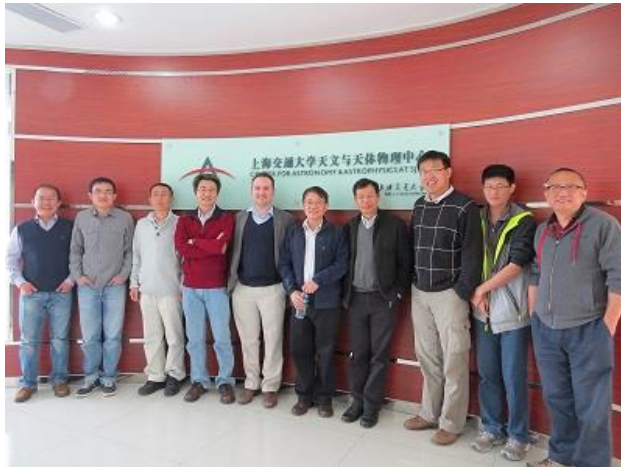


MoE Key Laboratory for
Particle Physics,
Astrophysics and Cosmology

Xiangdong Ji
Director

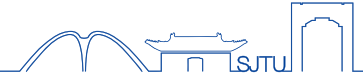
Institute of
Nuclear and
Particle Physics

Department of
Astronomy



Manpower: **Faculty 32, Engineers 6, Secretariat 6**
26 Postdoctoral Fellow; 41 Ph.D +19 Master students

Manpower of INPAC



➤ Pre-INPAC days of Particle and Nuclear Physics (2000-2008)

2000, Lei-Wen Chen (Heavy iron theory)

2002, Xing Wang (finite temperature field theory)

2004, Yu-Min Zhao (Nuclear structure theory)

2007, Yang Sun (Astronuclear theory)

➤ The INPAC Era~ (INPAC established in 2009)

2009, Xiangdong Ji, founding director (QCD/Dark Matter– Theory/Exp.)

2009, Kai-Xuan Ni (Dark matter exp.). Left for UCSD, 2015

2009, Xiang Liu (Neutrinoless double beta decay exp) Left for Germany, 2015

2010, Karl Giboni (Dark matter exp), Xiao-Gang He (Particle theory)

2011, Jianguai liu (Neutrino/DM exp)

2012, Changbo Fu (Nuclear/DM exp), Liang Li, Haijun Yang (Collider exp)

2013, James Loach (dark matter/beta decay exp), Yong-Zhong Qian (Astronuclear theory)

2014, Pei-Hong Gu, Wei Wang (Particle theory), Jun Guo (Collider exp)

2016, Ke Han (Neutrino), Yong Yang (DM), Ning Zhou (DM), Jun Gao (Particle theory),

2017, Hong-Jian He (Particle Theory), Shu Li (Collider exp), Yue Zhao (Particle Theory)

Particle Theory

3 Professors + 4 Associate Professors + 3 Postdoc



Xiao-Gang He



Xiangdong Ji



Hong-Jian He



Wei Wang



Pei-Hong Gu



Jun Gao



Yue Zhao (new)



Nuclear Theory

4 Professors + 1 Associate Professor + 4 Postdoc



Lei-Wen Chen



Yang Sun



Yu-Min Zhao

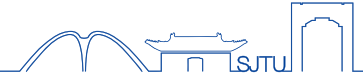


Xing Wang



Yong-Zhong Qian

Underground Experiments



- PandaX : Dark Matter direct search with Xenon TPC
- Daya Bay and JUNO: Neutrino oscillation physics
- PandaX-III and CUORE: Neutrinoless double beta decay
- Members: **3 Professors + 4 Associate Professors**
6 engineers + 6 Postdoc + 14 students



Xiangdong Ji



Jianglai Liu



Karl Giboni



Changbo Fu



Ke Han



Yong Yang



Ning Zhou

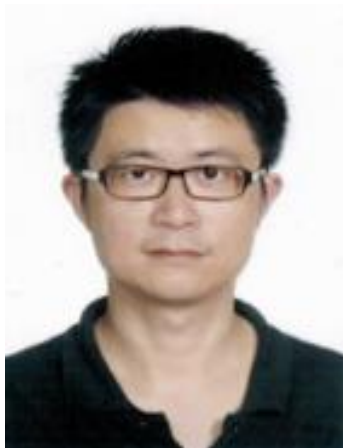
Collider Experiments



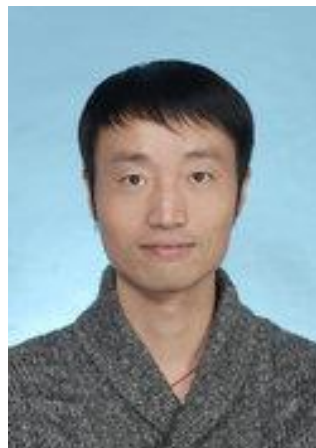
- ATLAS at LHC (eg. Higgs, SMEW, BSM, muon upgrade)
- BESIII at BEPCII
- Muon g-2 at Fermilab
- CEPC R&D
- Members: **1 Professor + 4 Associate Professors**
10 Postdoc + 14 students



Haijun Yang



Liang Li



Jun Guo

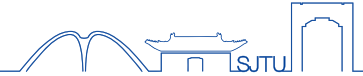


Ning Zhou



Shu Li (new)

Research Areas of INPAC



Underground Experiments PandaX/Dayabay/JUNO

Xiangdong Ji
Karl Giboni
Jianglai Liu
Changbo Fu
Ke Han
Yong Yang
Ning Zhou

Collider Experiments ATLAS/BESIII/CEPC

Haijun Yang
Liang Li
Jun Guo
Ning Zhou
Shu Li

Lie-wen Chen
Yang Sun
Xing Wang
Yu-Min Zhao
Yongzhong Qian

Theoretical
nuclear
physics

Area of
Research

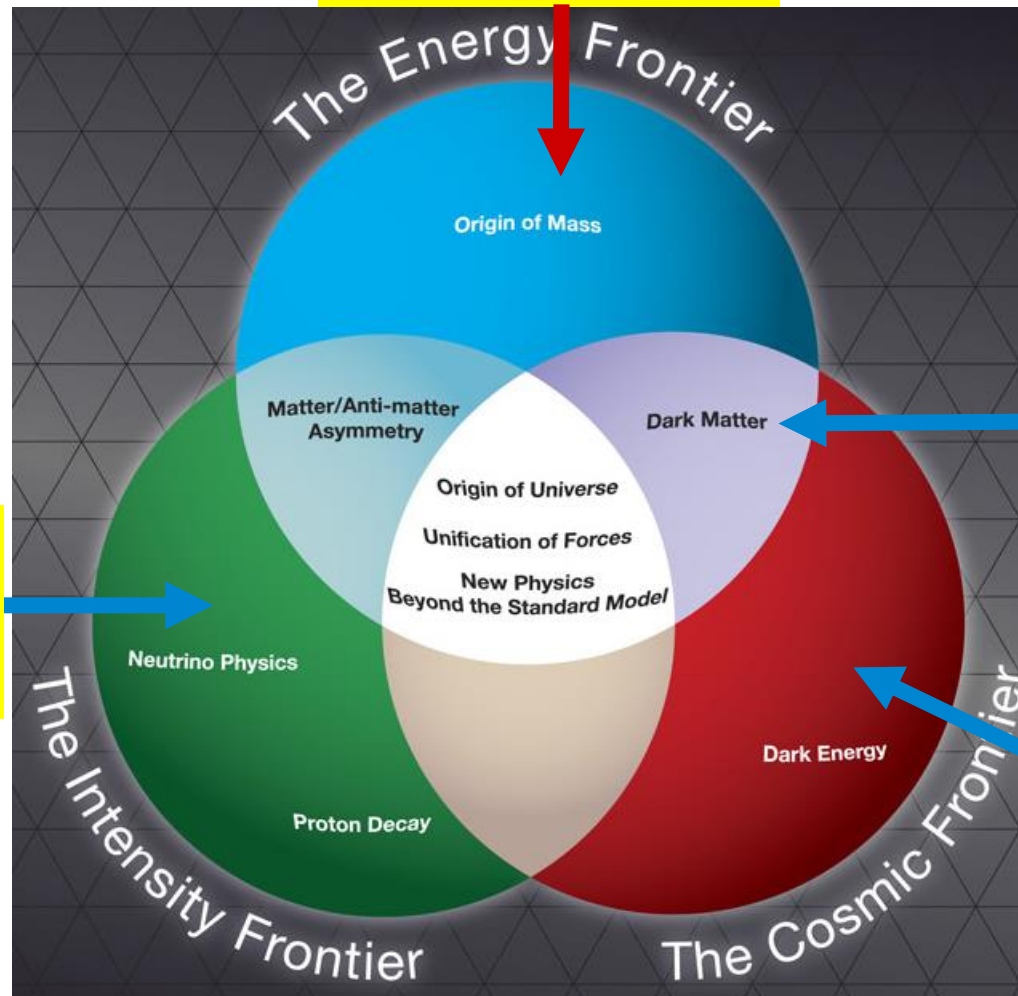
Theoretical
particle
physics

Xiangdong Ji
Xiao-Gang He
Hong-Jian He
Wei Wang
Pei-Hong Gu
Jun Gao
Yue Zhao

Research Areas of INPAC



ATLAS @ LHC



DayaBay/JUNO
PandaX-III
BESIII, Muon g-2

PandaX-I
PandaX-II
PandaX-4T

Department of Astronomy

Some Statistics (2016)



Manpower

- Faculty: 22 + 10
- Engineers: 6
- Secretaries: 3+3
- Postdocs: 26 (10 new)
- Students: 60 (41 PhD students, 19 Master students),
- 10 alumni (8 PhDs, 2 masters)

Research Activities

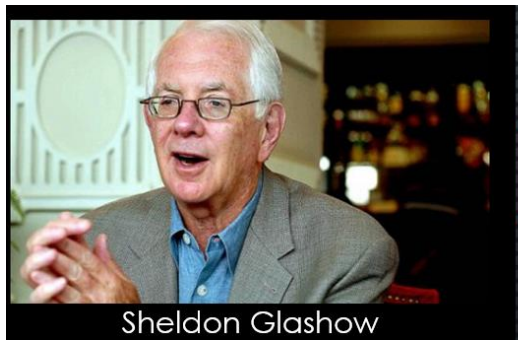
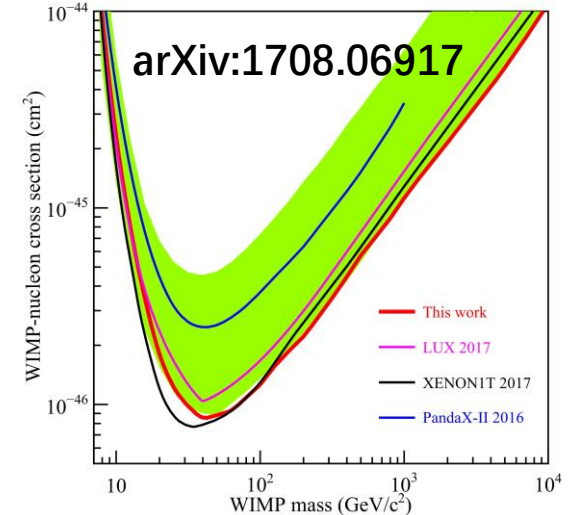
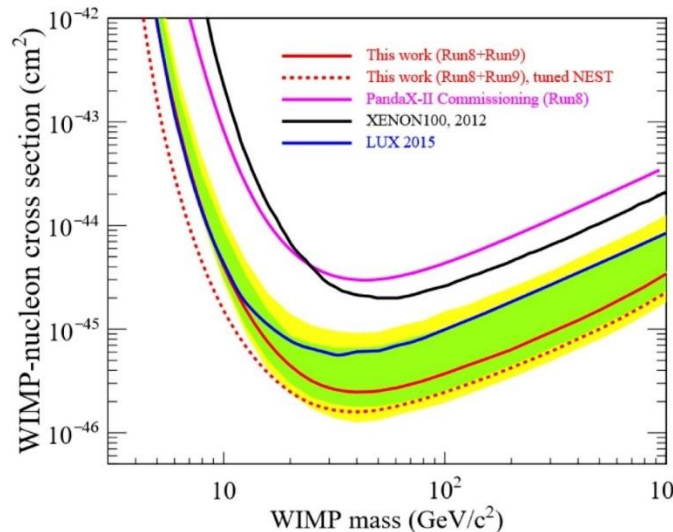
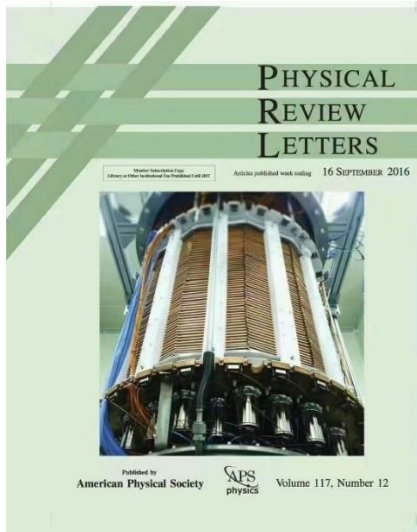
- Invited talks: 69
- Hosted Workshops or Conferences: 12
- Visitors/seminar: 70
- Public open day

Achievements

- Published Articles : 122
- Research Projects : 79 (27 new)
- Awards: 4

Highlight: PandaX-II Dark Matter Search

- PandaX-II (33ton*day) , $2.5 \times 10^{-46} \text{ cm}^2$ @40GeV, PRL 117, 121303 (2016)
- PandaX-II (45ton*day), major background reduction, $8.6 \times 10^{-47} \text{ cm}^2$ @40GeV



China has been taking giant steps in particle physics! The multinational Daya Bay experiment was the first to measure θ_{13} despite many unsuccessful prior attempts elsewhere, such as the French. This was a truly important discovery. Further precision studies of neutrino oscillations will soon be carried out at the JUNO facility. These are expected to resolve the important question of neutrino hierarchy. China has also entered the dark matter sweepstakes with Panda-X, a series of Xenon detectors with increasing sensitivity at the world's deepest underground lab. As of this year (2016), PandaX-II has established the world's most stringent dark matter constraint [5]. Significant future increases in sensitivity are planned.

Lastly, BEPC II has achieved world record luminosity for e^+e^- collisions in the energy range 2--4 GeV. With its new BES III detector, it has obtained several exciting results, such as the discovery of the Z_{c} (3900) particle, with more new states soon to follow. A major physics particle base has emerged, with a remarkable growth spurt, as is both befitting and essential if China is to host the Great Collider.

→ Xiangyi's talk for latest results !

PandaX-III Design Report



arXiv:1610.08883

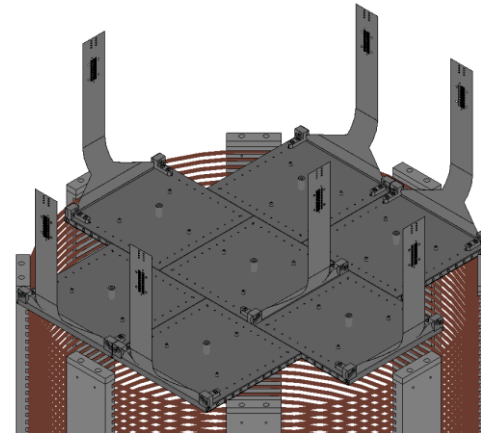
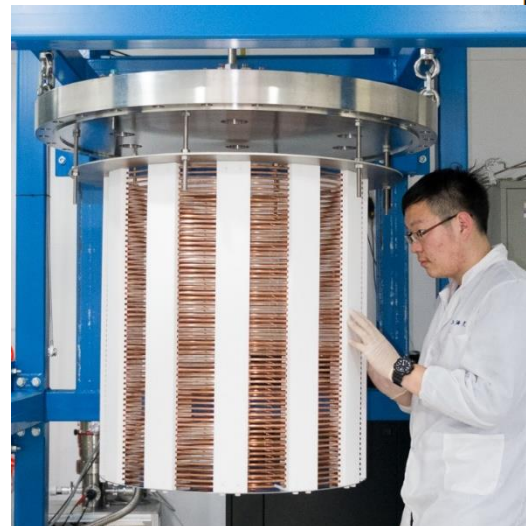
- Neutrinoless Double Beta Decay with High Pressure ^{136}Xe Gas Time Projection Chambers



PandaX-III: Searching for Neutrinoless Double Beta Decay with High Pressure ^{136}Xe Gas Time Projection Chambers

- R&D on 20kg prototype

Xun Chen¹, Changbo Fu¹, Javier Galan¹, Karl Giboni¹, Franco Giuliani¹, Linghui Gu¹, Ke Han^{*1}, Xiangdong Ji^{1, 10}, Heng Lin¹, Jianglai Liu¹, Kaixiang Ni¹, Hiroki Kusano¹, Xiangxiang Ren¹, Shaobo Wang¹, Yong Yang¹, Dan Zhang¹, Tao Zhang¹, Li Zhao¹, Xiangming Sun², Shouyang Hu³, Siyu Jian³, Xinglong Li³, Xiaomei Li³, Hao Liang³, Huanqiao Zhang³, Mingrui Zhao³, Jing Zhou³, Yajun Mao⁴, Hao Qiao⁴, Siguang Wang⁴, Ying Yuan⁴, Meng Wang⁵, Amir N. Khan⁶, Neill Raper⁶, Jian Tang⁶, Wei Wang⁶, Jianing Dong⁷, Changqing Feng⁷, Chen Li⁷, Jianbei Liu⁷, Shubin Liu⁷, Xiaolian Wang⁷, Danyang Zhu⁷, Juan F. Castel⁸, Susana Cebrián⁸, Theopisti Dafni⁸, Javier G. Garza⁸, Igor G. Irastorza⁸, Francisco J. Iguaz⁸, Gloria Luzón⁸, Hector Mirallas^{8,1}, Stephan Aune⁹, Eric Berthoumieux⁹, Yann Bedfer⁹, Denis Calvet⁹, Nicole d'Hose⁹, Alain Delbart⁹, Maria Diakaki⁹, Esther Ferrer-Ribas⁹, Andrea Ferrero⁹, Fabienne Kunne⁹, Damien Neyret⁹, Thomas Papaevangelou⁹, Franck Sabatié⁹, Maxence Vanderbroucke⁹, Andi Tan¹⁰, Wick Haxton¹¹, Yuan Mei¹¹, Chinorat Kobdaj¹², and Yu-Peng Yan¹²



Research Projects (79, 27 new in FY2016)

MOST Funding : 15 (5 new in FY2016)

NSFC: 33 (11 new in FY2016)

National 1000-young-talent: 11 (4 new in FY2016)

Funding from Shanghai : 10 (3 new in FY2016)

Others : 11 (4 new in FY2016)

Total grants in FY2016: 48.8M RMB

Host conferences/workshops (2016)



Host conferences/workshops (2017)



第五届大型强子对撞机物理国际研讨会 The 5th Annual Conference on Large Hadron Collider Physics (LHCP)

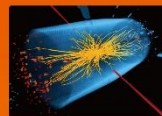
上海交通大学 2017年5月15-20日 Shanghai Jiao Tong University May 15-20, 2017



International Summer School (2017)



The Fourth International Summer school on TeV Experimental Physics (iSTEP 2017)



The International Summer school on TeV Experimental Physics (iSTEP) is a series of summer schools aiming to introduce and guide the first steps ("iSTEP") for beginners at particle physics on TeV high energy experimental and theoretical physics topics.

TeV高能实验物理暑期学校(iSTEP)面向粒子物理的初学者，将努力打造成国内外粒子物理界名师讲坛；对粒子高能物理发展历史，实验装置、实验目标、实验手段以及理论框架进行详细的介绍；塑造实际体验和DIY互动特色教学，力求做到生动活泼有理有趣。

开学起止日期：2017年6月28日至7月4日

举办地点：上海交通大学物理与天文学院物理楼101和李政道研究所

暑期学校网站：<http://indico.leeinst.sjtu.edu.cn/event/18/>

暑期学校联系方式：istep2017@sjtu.edu.cn

讲课题

- 特殊的粒子物理世界
- 粒子与量子历史
- 高能物理的发展历史
- 带电粒子的发现和诺贝尔奖
- 夸克和胶子
- 上海粒子物理的小故事
- 高能物理的成就和展望
- 为什么高能态大至粒子碰撞呢?
- 计算方法以及计算与高能物理上的应用

互动类

- 高能物理知识竞猜
- 中国好实验-DIY科学实验
- 中国好物理-DIY大装置分析
- 中国好物理-DIY科学演讲

暑期学校顾问委员会成员:

胡宁 (北大), 戴国雄 (浙大), 朱向东 (复旦), 曹建晖 (南开), 彭承志 (北大), 冯国祥 (清华), 刘洪 (U. Pittsburgh), 李向前 (上海交通大学), 曹天石 (清华), 曹卫 (复旦), 俞允强 (复旦), 王智 (复旦), 李翔 (U. Arizona), 刘洪 (U. Chicago), 王杰 (清华), 王鹏飞 (清华), 张宇英 (山大), 赵海 (科大)

暑期学校组织委员会成员:

张宇 (复旦), 彭静 (清华), 方强 (复旦), 程宇 (上交), 李俊 (交大), 廖时 (北大), 廖时 (清华), 刘洪 (科大), 高亮 (山东大学), 刘迪 (复旦), 孙昊 (北大), 曹卫 (复旦), 曹天石 (复旦), 赵海 (复旦), 王智 (交大), 姚宇 (清华), 周宇 (清华)

资助单位:



Website: <http://indico.leeinst.sjtu.edu.cn/event/18/>

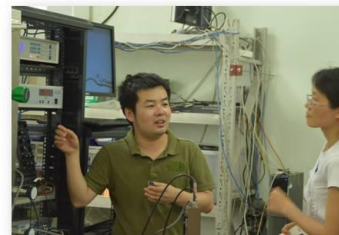
Contact: istep2017@sjtu.edu.cn

iSTEP2017暑期学校微信群扫码入群

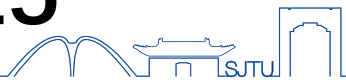


INPAC Open Day

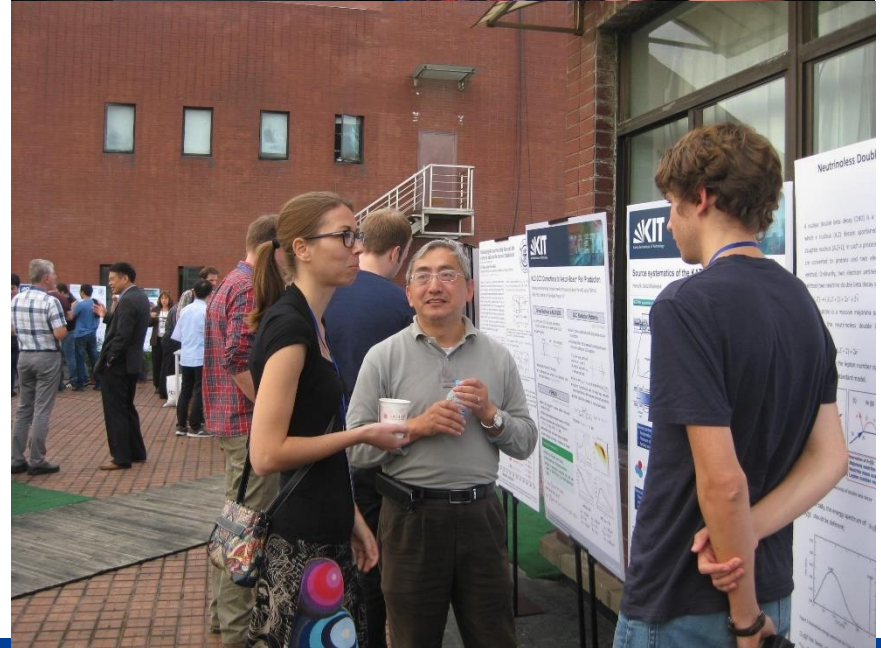
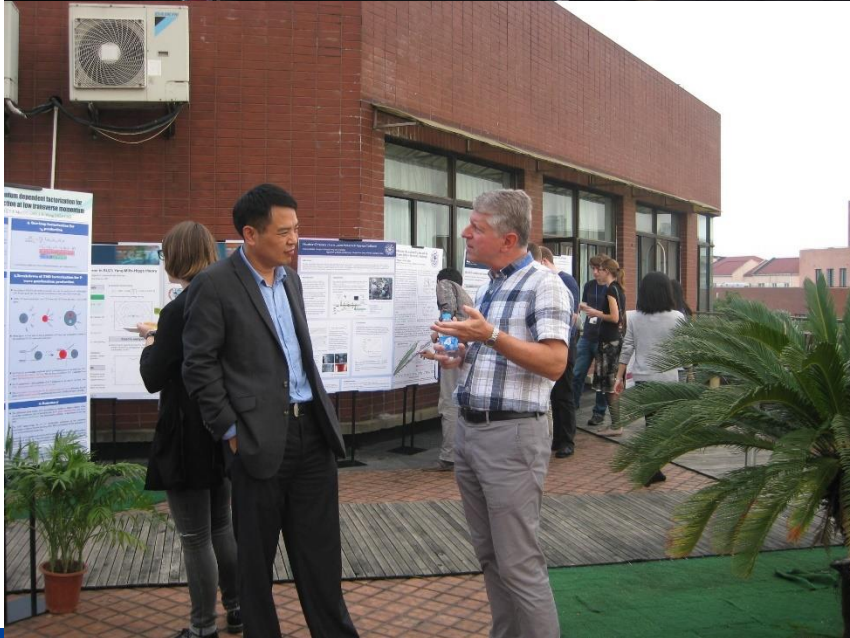
The INPAC open day for public in 2016. > 200 students and parents attended Laboratory tour and participate various hands-on activities.



Joint workshop @ SJTU in 2015



- 2015 SJTU-KIT joint workshop (November 4-6, 2015)
 - 10 talks + 1 colloquium from KIT
 - 9 talks from SJTU, 8 talks from other Chinese institutes
 - 5 + 5 posters from SJTU and KIT
- Topics: Particle Physics, Astroparticle, Detector technologies
- Faculty and students discussions (1.5h)
- Lab visit (1h)







Other activities between KIT and SJTU

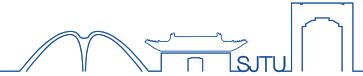


- **3/10/2017:** KIT Vice President Thomas Hirth visited SJTU, Ke Han and Haijun Yang from INPAC joined the meeting.
- **5/15-20/2017:** The 5th Annual Conference on Large Hadron Collider (LHCP) at SJTU, three KIT faculty and student participated:
 - Thomas Muller, Monika Blanke, Nils Faltermann
- **6/12-14/2017:** Horst Hohberger visited KIT for “StratP-China”
- **9/11/2017 – 1/14/2018:** A master physics student Jannis Lang from KIT plans to visit and study at SJTU for four months, to work with Ning Zhou on the PandaX dark matter search experiment.

Workshop @ KIT in 2017



- 2017 KIT-SJTU workshop on “Particles and the Universe” (September 6-8, 2017)
 - 6 talks from KIT
 - 7 talks from SJTU (Haijun Yang, Xiaogang He, Ke Han, Jun Guo, Wei Wang, Jun Zhang, Xiangyi Cui)
 - 5 + 5 posters
- Topics: Particle Physics, Astroparticle, Detector technologies
- Faculty and students discussions (1h)
- Lab visit (2.5h)



**Many thanks for your invitation,
providing financial support,
organizing a wonderful workshop !
Looking for more closer collaboration !**

