The Dean’s Address

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goal, we will carry out our distinguished traditions, identify the specific target purpose, construct a scientific and

universities at home and abroad, there are quite few whose fields of study can be as broad as ours –

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active e orts in order to build our school into a leading institute of physical education and research that not only

Contents

| *Highlights*

Highlights

01 Institute of Theoretical Physics

There are 19 members in the institute with 18 faculty members and one administrative sta . The research fields

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I. The study of spin-singlet charmonium ηc production

Dzc

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Bi-annual Report

II. QCD NNLO and resummation e ects on the observables at hadron colliders

by obtaining the high fixed-order expansion of or the

,

σ √ σ

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e ects for the signal-background interference process

,

| *Highlights*

III. Precision predictions for top quark pair production

result shows that the resummation e ects significantly

theoretical predictions for di erential cross sections of

space, and the conflict between theory and experiment

results for the di erential cross sections cannot agree

regions. These issues call for higher order QCD e ects

made significant progress on this problem.

Bi-annual Report

02 Institute of Condensed Matter and Material Physics

distinguished young scholars. The research fields covering a wide range include Devices and Physics of Wide-

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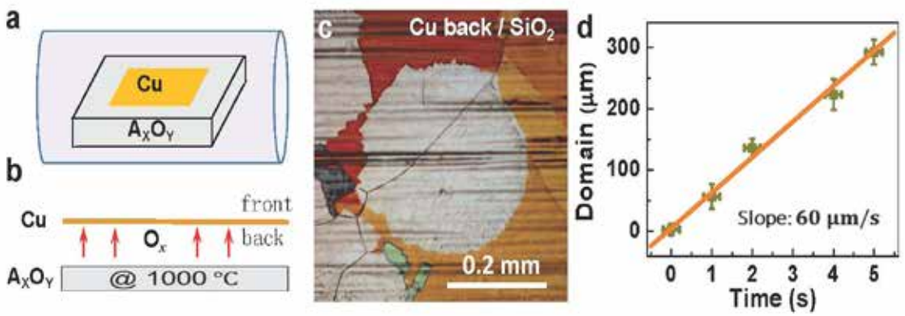
| *Highlights*



I. New world record of graphene growth rate

films are required and the chemical vapour deposition

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cost e ciency. However, CVD graphene growth rates

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Bi-annual Report

| *Highlights*

II. High-output-power e-beam pumped ultraviolet light source

high-e ciency and environmentally friendly sources.

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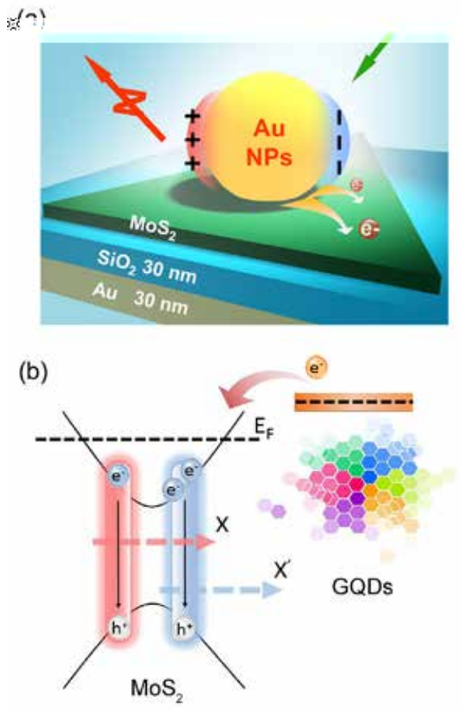
e ciency through the sapphire/AlN interface we made

To avoid the di culty in p-type doping, we adopt an

hence free of misfit dislocations and (3) The UV light

| *Highlights*



Plasmonic nanostructure induced near-field modes can

controlled optical doping process. The doping e ect is

III. Light control of exciton-plasmon interaction in low-dimensional materials

Bi-annual Report

Scholar Program, 2 chief scientists of 973 projects, 2 leading talents in scientific and technological innovation

national major scientific research instrument development project "femtosecond-nanometer space-time resolution optical experimental system", which o cially launched in 2016. Research achievements in the project of “ on High E ciency Organic Blue Light-emitting Materials and Mesoscopic Structural Light-emitting Devices ” ′ s groups won the first prize of High Education Natural

E cient Single Photon Emission

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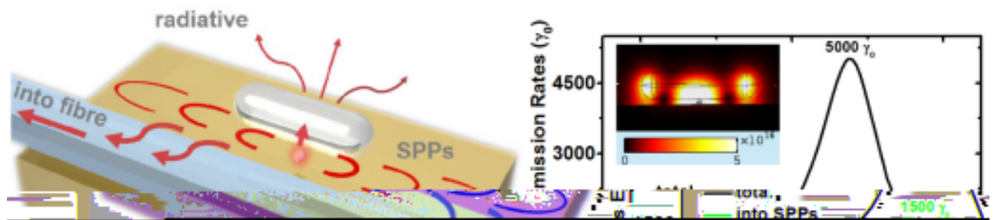

I. High-e ciency emission and collection of single photons at micro/nano scale

formed by metallic nanorod and nanofilm, Prof. Ying

γ γ

the phase-matched low-loss nanofibers. The proposed

the

II. Theoretical Studies on Ultrafast Dynamics of Atoms and Molecules in Laser fields

of atoms and molecules in laser fields by our faculties

Physical Review B/T2005 Tc 0.083 Tw 0doubgat(tunneling Foundati He [(txuv pulses t a ch tl)99iProf. Qihuan( )]TJ 0.038 Tc 0.0
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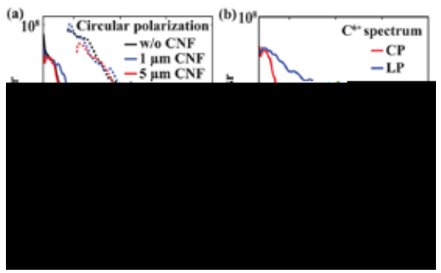
field, such as theoretical and computational methods,

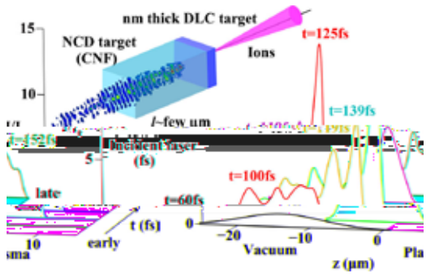
III. Multi-channel photonic devices integration

field-confinement e ect of plasmonics and low-losses

| *Highlights*

Bi-annual Report





age structure. There are 46 sta members, in which here are 2 academician of Chinese Academy of Sciences, 4

confirmed the self-focusing and self-steepening e ect

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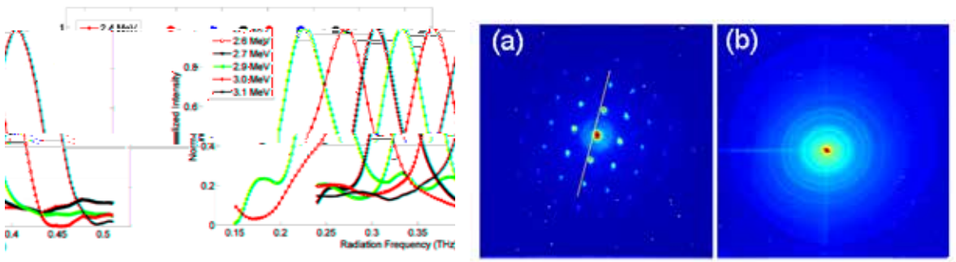
DC-SRF THz UED

| *Highlights*



DC-SRF photoinjector. Left: measured THz superadiant undulator radiation spectra with di erent electron beam energies. Right: measured electron di raction patterns from a single-crystalline Au foil (a) and a polycrystalline

II. High-repetition-rate THz radiation and UED study based on the DC-SRF photoinjector

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demonstrated MeV electron di raction at MHz repetition

applications in ultrafast electron di raction (UED). It is

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Bi-annual Report

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III. PKU high intensity DC proton source creates a new record for long-term stability and reliability

beam-o s is a big challenge.

significant for the entire equipment. These issues

availability,

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system and one gas flow control problem appeared and the longest uninterrupted run time was five hours (J.

| *Highlights*

05 Institute of Plasma Physics and Fusion Studies

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I. The Laser-accelerated Ion-beam Trace Probe (LITP): a New Diagnostics method of 2D profiles of the poloidal magnetic and radial electric field in tokomaks

Poloidal magnetic field is one of the basic parameter in the magnetic-confined fusion (MCF) studies. Basic

electric filed is another important parameter in MCF.

turbulent plasma transport. So electric field diagnostic

influenced by the the magnetic field and electric field.

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radial electric field profiles can be reconstructed using

We have finished the calculations of the basic principle

revolution and are di cult for a 2D diagnose, which

and engineer technology. So a 2D magnetic field and electric field diagnostic with high temporal and spatial

06 Department of Technical Physics

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” research professor), 1 senior engineer, 1 lecturer and 5 engineers. The research fields

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| ***Highlights***

XYZ

$e^+e^- \to (DD^*)^0\pi^0 + c.c.$

$(D\bar{D}^*)^0$

ψ $J/\psi \to \gamma K_S^0 K_S^0 \pi^0$

$K_S^0 K_S^0 \pi^0$

| *Highlights*

II. Hidden pseudospin and spin symmetries and their origins in atomic nuclei

| ***Highlights***

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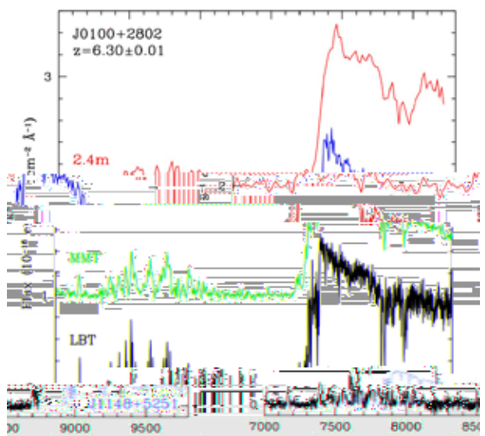
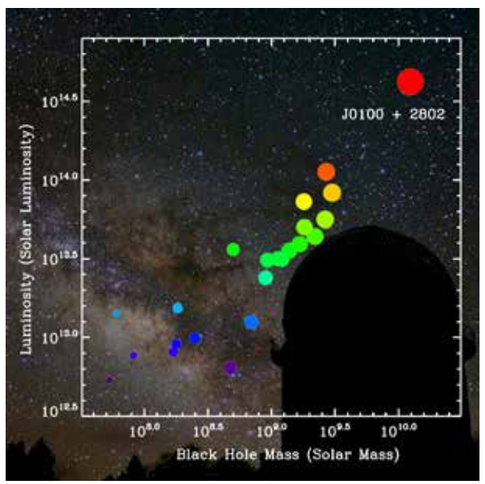
| *Highlights*





I. Discovering the most luminous object with the most massive black hole in the early Universe

and Scientific American in the USA, Reuters and the

Bi-annual Report

′ Magellan telescopes (outside China) confirmed that it

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| *Highlights*

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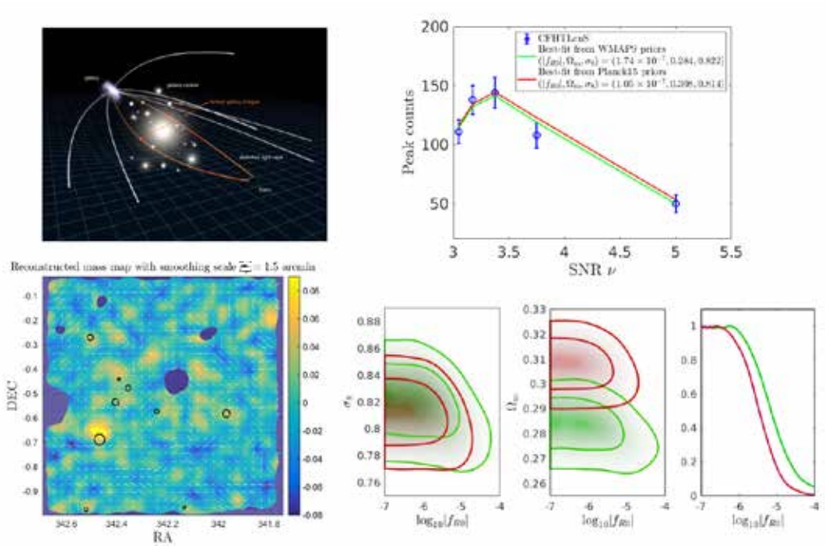

Fig.1 Upper left: an illustration of the gravitational lensing e ect; Lower left: a reconstructed convergence map

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WL peak statistics are much less a ected by baryonic

II. Constraining modified gravity from weak lensing peak statistics

the noise e ect arising from intrinsic shapes of source

owing to the chameleon e ect. However, the structure

| *Highlights*

08 Department of Atmospheric and Oceanic Sciences

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disciplines (climatology and physical oceanography). In 1993, AOS was selected in the first group of “
Natural Science Basic Scientific Research and Teaching Training Base – ”
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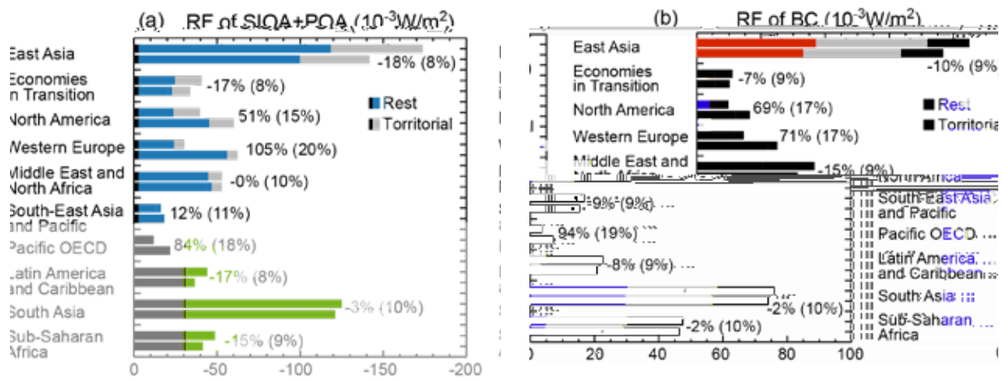
Talent Scholars. Research fields within AOS cover meteorology, climatology, atmospheric physics, atmospheric



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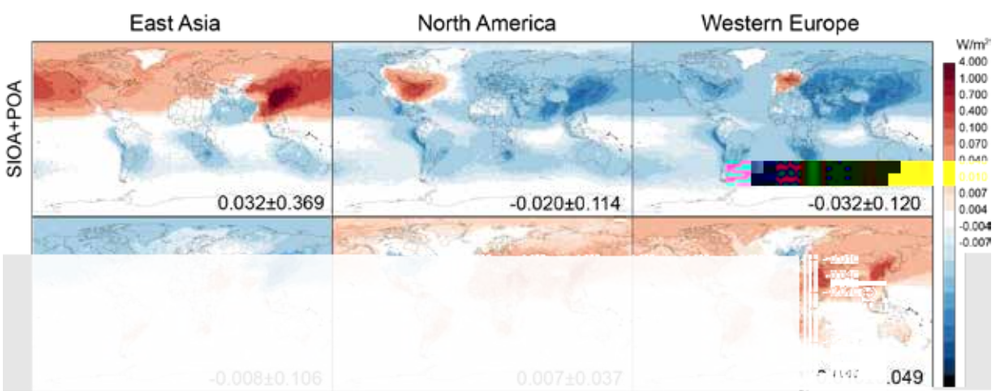

Figure 2. Global di erences between consumption- and production-based radiative forcing (RFc – RFp) in 2007.

| *Highlights*

I. Globalizing air pollution and climate forcing

of production and thus a ects the spatial distribution

production of a particular product di ers significantly

e ect of trade and atmospheric processes on China ′

tremendous influences of economic trade in relocating

pollutants, the di erence between any region ′

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| *Highlights*

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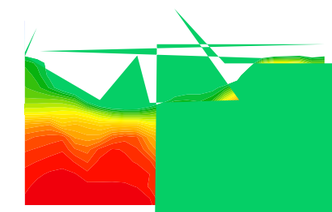


insolation at 45N; (b) Fresh water fluxes in NH and SH; (c) Observed EASM ind
Simulated EASM index (red, definition see f), and Simulated d18O (blue circle);
(Huang, et al., 2011, grey), Simulated SST gradient index (blue), Simulated EAWM

II. Revisiting the Co-variability of EASM and EAWM in the Past

| ***Highlights***

are also influenced by the long-term variations of land

proxy findings that challenge this assumption, people

,

for each (orbital; fresh water flux; ice; and greenhouse

VOCs and NOx, climate warming may a ect surface

precursor to ozone. The flux of isoprene from forests

related to the NOx-sequestration e ciency during the

09 Teaching Center for General Physics

demonstration and 10 teaching groups. Each of them is led by a moderator and is dedicated to teaching a specific

Since its establishment, the Center has set very high standards for each course and made great e ort to achieve

2014 10

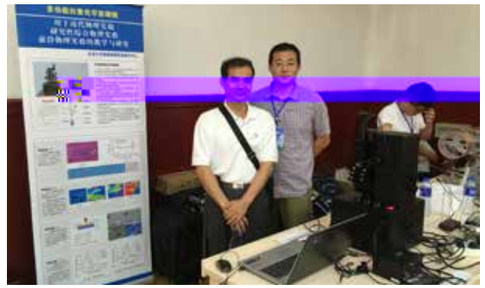
I. In October of 2014, Prof. Xi-Hua Zhong published one textbook titled ''A General Course in Electromagnetism''. The publisher is Peking University Press.

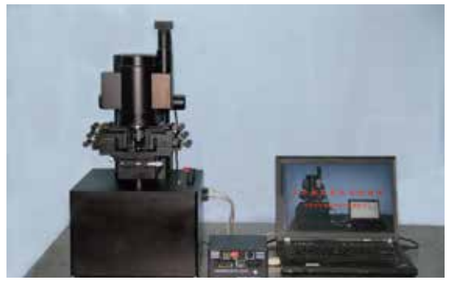
vector fields as well as the boundary-value problems

the fields produced by the electric charge distribution

capable of explaining di cult concepts and techniques

10 Teaching Center for Experimental Physics





I. The " Multifunctional Raman Optical Microscope " won the first prize of national college physics experimental instrument evaluation

Experimental Physics, won the first prize at the ninth

| *Highlights*

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nanoantenna, the highly e cient lowest-order antenna mode was e ectively transferred into inactive higher-

Wenjie and Liu Shang contributed equally as first auth

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lly as first authors to the work.

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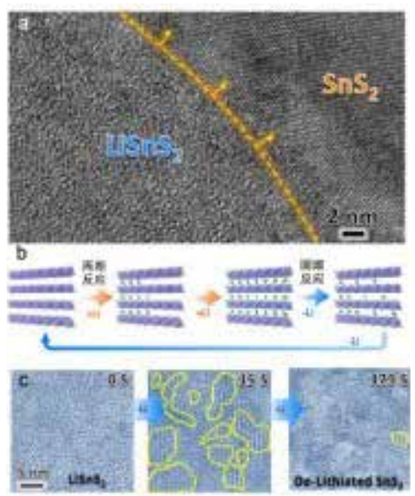
400,000 RMB for each. The total value of the instruments is about 150,000,000 RMB. Now there are 11 sta s in

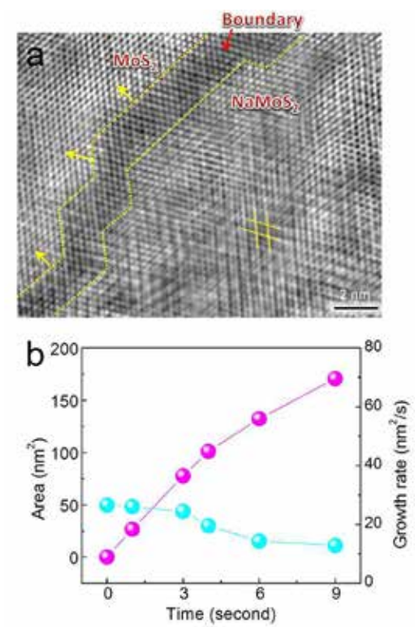
' ' fellow. In the sta team,

Each year, EML provides characterization services for more than 200 research groups in di erent departments

| *Highlights*

I. Tracking ion migration in 2D materials by in situ electron microscopy





its ion migration behavior is di erent from lithium ion.

this field.

Laboratory has achieved progress in this field recently.

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ABF

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(annular bright-field)

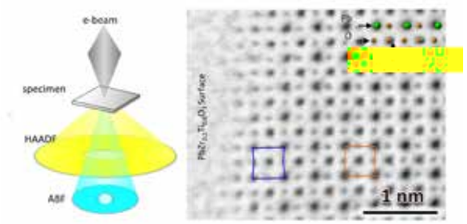

Figure 1. (a) Schematic of annular bright-field (ABF)

II. Atomic mechanism of polarization-controlled surface reconstruction in ferroelectric thin film

Recently, the advancements of the annular bright-field

progress in this field. By using the ABF, they find that

extremely di cult to extract the information of surface

engineering ferroelectric thin films, fine grain ceramics

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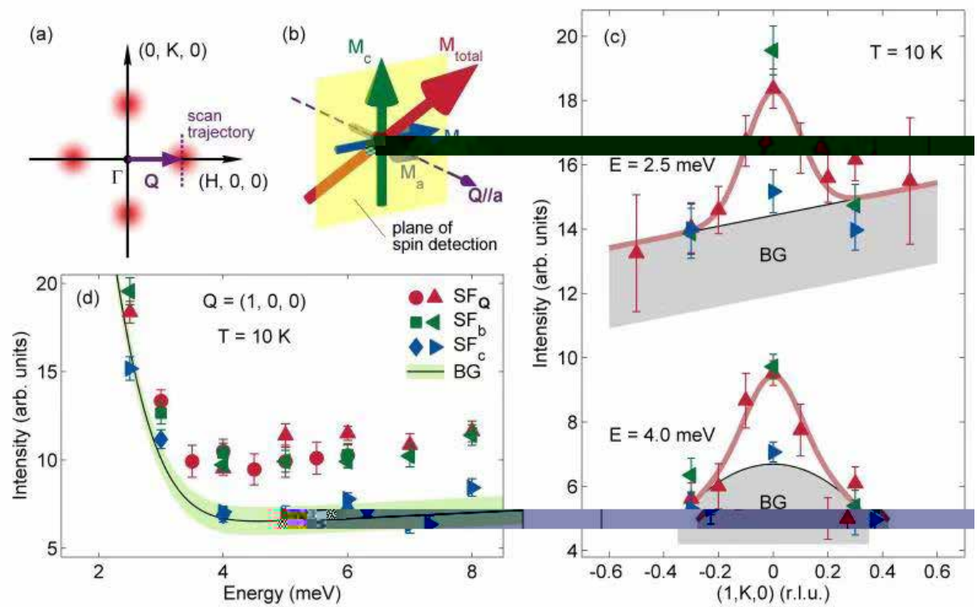
I. Nematic order and spin-orbit interactions in Fe-based superconductors



spin-flip, SF

Bi-annual Report

| *Highlights*

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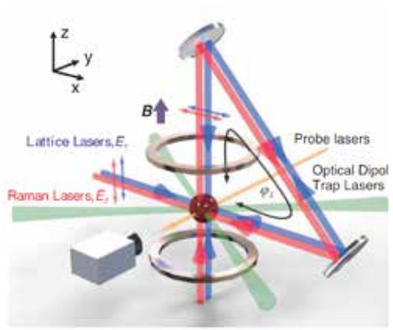

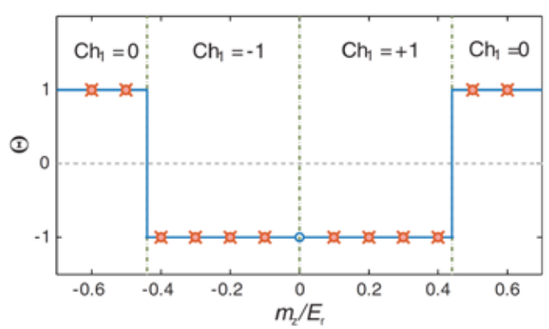

II. Realization of 2D spin-obit coupling for ultracold atoms and new progresses

interest in emulating SO e ects and topological phases

o er extremely clean platforms with full controllability

field of ultracold atoms.

lattice, without phase-locking or fine-tuning of optical potentials. The controllable SO e ects and nontrivial

″ ″

synthetic gauge fields, and can open a broad avenue in

Edelstein

curve; (c) mechanism of spin injection and IEE; (d) detected voltage signal dependent of magnetic field.

III. Spin injection and inverse Edelstein e ect in the surface states of topological Kondo insulator SmB_6

and measured the inverse Edelstein e ect as illustrated in the figure (c) and (d). Systematical measurements,

figure (a). This spin-momentum locking property gives rise to the Edelstein and inverse Edelstein e ects. At

correlation in TKIs for spintronics and highly e cient

as demonstrated in figure (b) and the previous surface

| *Highlights*

number of visiting scholars, and five administrative sta members.

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Bi-annual Report

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| *Highlights*

The lab is composed of about 80 key researchers, including 25 young talents recruited in the past five years. Each year the laboratory enrolls more than 50 PhD candidate students and 10 postdocs. The main research fields

devices which provide beams for users from multidisciplinary research fields. The lab is operating with broad

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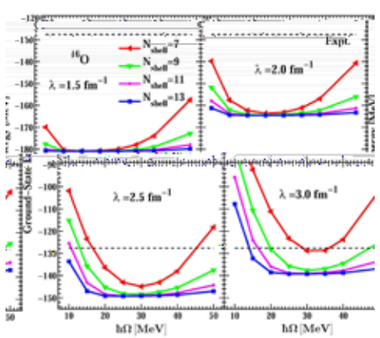
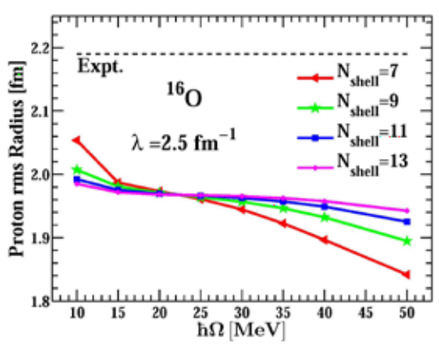
Bi-annual Report

| *Highlights*





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I. First-principles (ab initio) calculations of atomic nuclei

Only in the past decade, the first-principles calculation of nuclear physics has been developed significantly.

extended the first-principles calculations to a complex-

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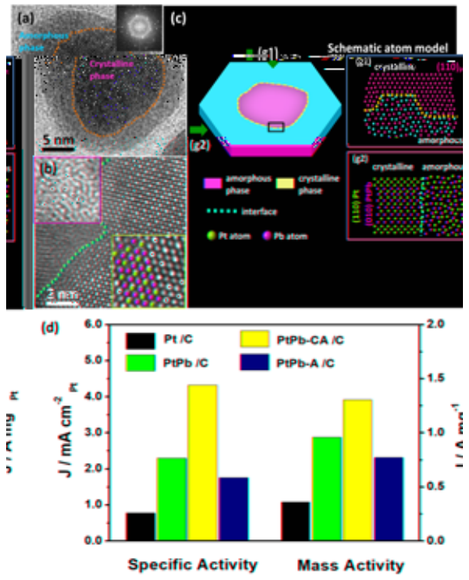
e ects from the continuum which is important for the

e ective field theory (chiral EFT) and further extended

Bi-annual Report

| *Highlights*



II. Mechanisms of high electrocatalytic performance enhanced by ion irradiation in two-dimensional nanomaterials

most e cient devices with many advantages, such as

key factor to a ect the quality of fuel cell, becoming

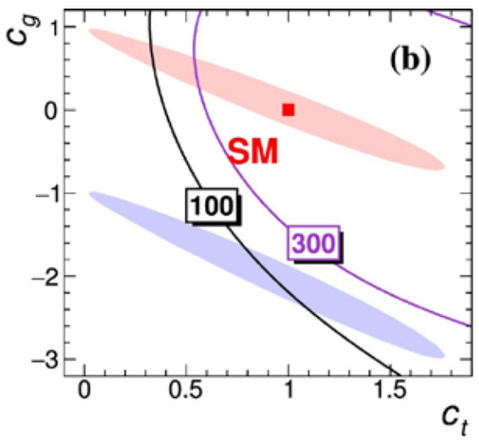
producing defects is only e cient for a few catalytic

energy-, dose-controllable and precision-modification, of highly e cient defect catalysts for future practical

They reported the first example on tuning/optimizing

nanoplates by ion irradiation to achieve more e cient

16 Center for High Energy Physics



cosmology, quantum field theory, particle physics phenomenology and hadronic physics.

I. Resolving the degeneracy in single Higgs production with Higgs pair production

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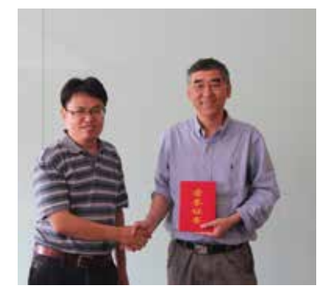

N | Bi-annual Report

representative Kanglin Huang from the 1980 physics class, who is Managing Director and Chief Risk O cer of

| *Alumni and Funds*

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internet products and finance.

Bi-annual Report

| *Alumni and Funds*

Alumni Funds:

Time of Establishment	Project Title	Donators
1987	Qisun Ye Experimental Physics Fund	Mr. Qisun Ye, his friends and students
1996	Yibing Xie Fund	Mr. Yibing Xie, his students (Mr. Jietai Mao et al.)
2002	77 '77 Physics Class Fund	77 The '77 physics class

Bi-annual Report

2013	PKU Physics Lecture Hall Chair Donation Fund	PKU physics alumni and community
2013	79 '79 Physics Class Fund for Garden Donation	79 The '79 physics class
2013	PKU Physics Video Meeting Room Fund	77 Mr. Tingkang Xia
2013	Physics Building Front-garden Fund	78 Mr. Ming Hu
2013	7802 PKU Physics 7802 Meeting Room Fund	78 The '78 phyiscs class
2013	PKU Partnership Fund	2012 The '12 physics graduates Ji Li, Hua Zong, and Jianbo Fu
2013	78 '78 Nuclear Physics Class Fund	78 The '78 nuclear physics class (Liqiang Ji et al.)
2013	PKU Xingcheng Fund	79 A '79 technical physics alumnus
2014	80 '80 Physics Class Fund	80 The '80 physics class
2014	PKU Physics New Liabrary Reading Room Fund	PKU physics alumni and community
2015	212 PKU Physics Buidling 212 Middle Room Chair Donation Fund	PKU physics alumni and community
2015	PKU Physics Jinhui Students Development Fund	97 Mr. Chenyang Wang and Ms. Ya Cheng

Exchange & Cooperation

The Centennial Physics Lectures

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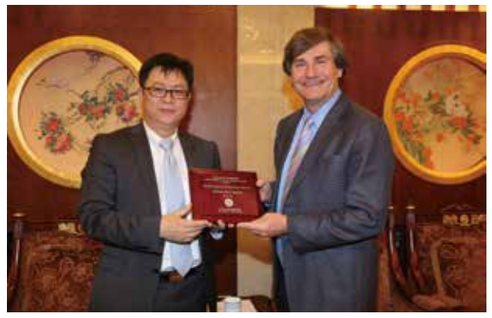

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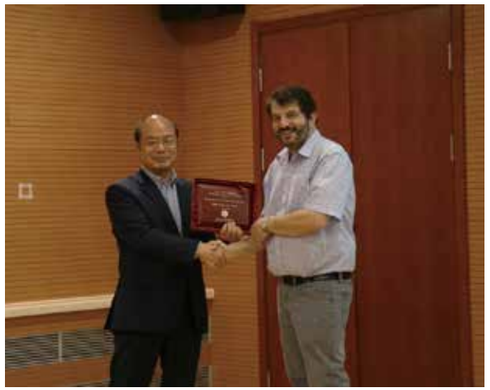
Albert Fert, an emeritus professor at Université Paris-Sud in Orsay and scientific director of a joint laboratory.



Invited Talks and Exchange Activities

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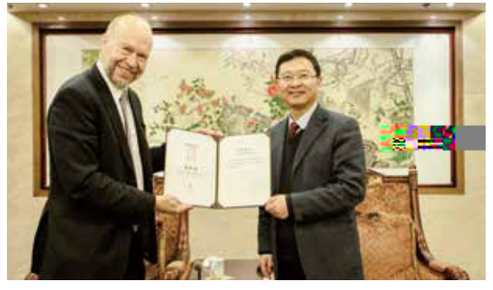
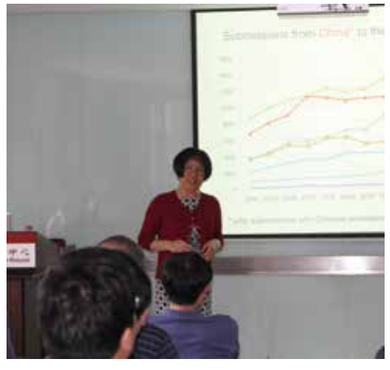
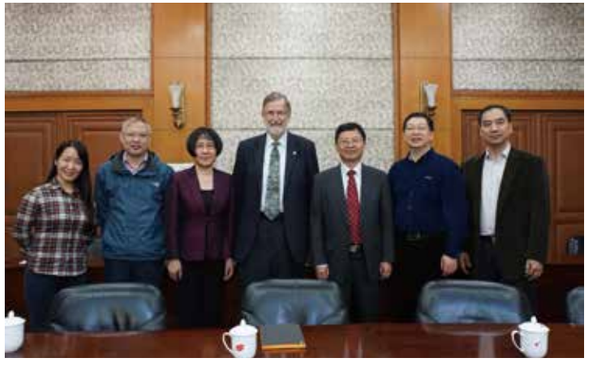
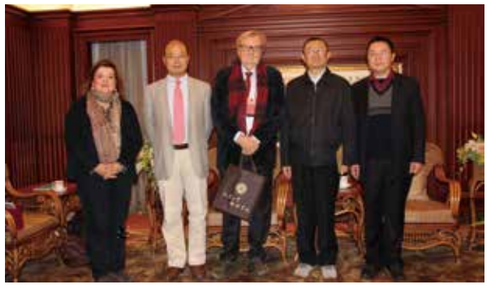
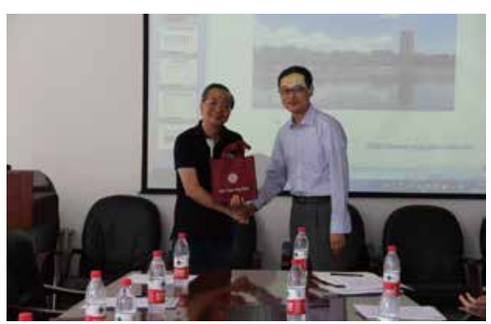
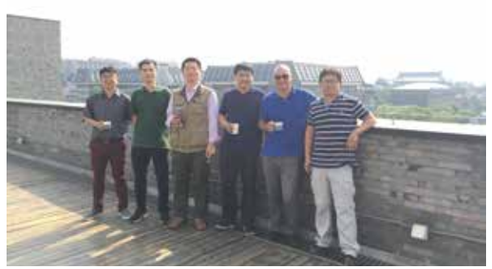




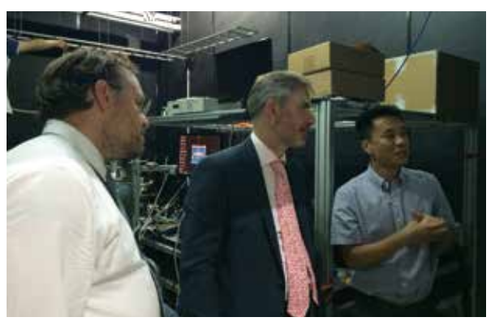








Vice President Jie Wang met with the delegation, accompanied by Vice Director of International Relations O ce



David Sokolo

President Prof. David Sokolo visited the school. Vice Deans Yongyun Hu and Shouhua Zhu held a discussion

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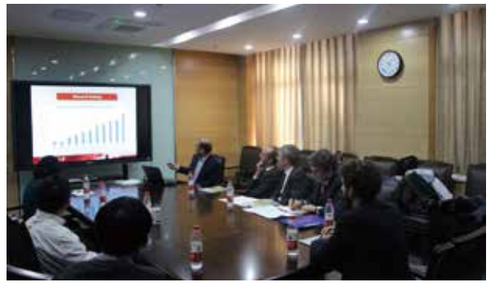
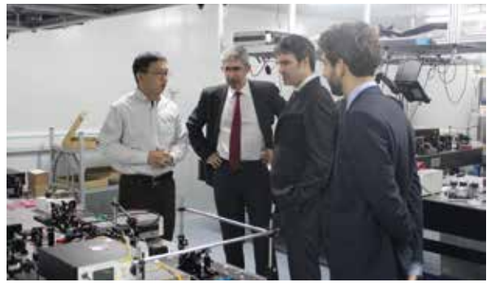
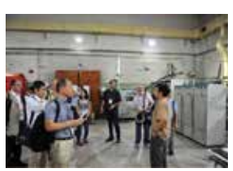
| *Cooperation*





/ **International/Hong Kong/Macao/Taiwan Conferences**

Bi-annual Report



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Awards & Honors

2015
In 2015,

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- “ ” “ ”

  Xuebing Wu' s team won the Ten Major Scientific Progress of Higher Education in China.

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  Yanlin Ye won the Scientific and Technological Progress Medal awarded by the Ho Leung Ho Lee Foundation.

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  Qihuang Gong was awarded the major scientific research instrument development projects approved by the

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| *Awards & Honors*

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- Jintai Lin won the first prize of Tu Changwang Youth Science and Technology Award by China Meteorological

2016
In 2016,

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- “ ” “ ”

  Jie Meng' s group won the Ten Major Scientific Progress of Higher Education in China.
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