2012 清華物理論壇(III)

第七屆
兩岸清華大學物理系研討會

時間：2012/09/29(六)-09/30(日)
地點：統一關西馬武督渡假會議中心

主辦單位：國立清華大學物理學系

協辦單位：前瞻物質基礎與應用科學中心 Frontier Research Center on Fundamental and Applied Sciences of Matters、國立清華大學

目錄

前言

September 25, 2012

Dear Colleagues and Friends:

Welcome to the 7th Cross-Strait Tsing Hua Physics Symposium! As a platform for enhancing mutual understanding and promoting collaboration and friendship between the two sister institutes, this symposium has played a critical and important role in the past. This year, we made some changes. First of all, the symposium was held off-campus. Away from the routines of the campus, perhaps the retreat-like atmosphere would help stimulate thinking out of the box. It is high time for some critical thinking. Higher education as we know may evolve into something completely different in the next decade. Are we preparing physics majors sufficiently for their future endeavors? How can an Asian university with limited resources compete globally in face of the likes of branches of Ivy League schools in our backyard or the Itunes University? This year, we also invited our graduate students and postdoctoral researchers to attend. My colleagues have been admiring the talented and hard-working students that Beijing Tsing Hua educated. On the other hand, the few exchange students from Being Tsing Hua that we hosted were known to have enjoyed their stay in Taiwan. Hopefully, we can arrange future symposiums promoting the interactions among our students as well.

It is perhaps fitting that the symposium is held during the mid-Autumn Festival, a time traditionally reserved for family reunion. We shall have a merry reunion of the greater Tsing Hua family!

With warmest regards,

Ci-Ling Pan, Professor and Department Chair
Department of Physics and Institute of Astronomy
National Tsing Hua University
Hsinchu, Taiwan

議程

2012 清華物理論壇(III)
--第七屆兩岸清華大學物理系研討會

會議日期：2012 年 9 月 29 日(六) 至 9 月 30 日(日)

會議地點：新竹關西馬武督會議中心

議　　程

日期：2010 年 9 月 29 日(六)		
時 間	活動項目	主持人
14：00	綜二館圖書館大門(校園公車站排)前集合出發	
15：00	馬武督 Check in 可自由使用飯店內休閒設施	
17：30 20：00	晚宴(Buffet) 馬武督梅園餐廳	
20：00	討論主題一：兩岸清華論壇 主持人：潘犀靈主任 會場：馬武督羅馬廳	
20：10	● 開幕致歡迎辭：古煥球院長 ● 北京清大代表致辭：薛其坤院長(兼物理系主任) ● 介紹雙方與會學者	會議主席：潘犀靈 主任
20：40	兩岸清華物理：現況、挑戰與前景	潘犀靈　主任 薛其坤　院長
● 備註：羅馬廳會場提供無線上網		

日期：2010 年 9 月 30 日(日) 會場：馬武督羅馬廳		
時 間	報告題目	演講者/報告人
10：00	**討論主題二：超導與材料物理 主持人：古煥球院長**	
10：10	How unconventional are the unconventional superconductors	薛其坤　院長
10：30	可突破光學繞射極限的奈米雷射	果尚志研發長
10：50	茶敘及壁報欣賞	
11：00	**討論主題三：原子、分子物理與光學 主持人：施宙聰教授**	
11：10	Ultra High Resolution Optical Coherence Tomography and Nonlinear Confocal Microscopy Using Ultra Fast Laser	薛　平　教授
11：30	Ultracold Molecule and Atom-molecule Collision	劉怡維　教授
11：50	交流討論 與會來賓團體照	
12：00	午餐(馬武督梅園中餐廳)	
13:50	**討論主題四：高能與天文物理 主持人：馮達旋副校長**	
14：00	Investigation of the quark-gluon plasma employing the Boltzmann kinetic theory	徐　喆　教授
14：20	Exploring the dynamic high energy universe with the Fermi Space Gamma-ray Telescope	江國興　教授
14：40	**討論主題五：凝態物理 主持人：王道維教授**	
14：50	Studies on Carbon Nanotubes -- from Growth Mechanisms to Applications	姜開利　教授
15：20	Decoherence in an Aharonov-Bohm Interferometer	陳正中　教授
15：40	茶敘及壁報欣賞	
17：00	賦歸	

大會演講者簡介

How unconventional the unconventional superconductors are?
非常规高温超导非常规在什么地方？

薛其坤 Qi-Kun Xue

北京清华大学物理系

一、研究領域簡介

薛其坤，男，1980－1984 年于山东大学光学系激光专业学习（理学学士），1987－1994 年在中国科学院物理研究所凝聚态物理专业学习（理学博士学位）。1994 年至 2000 年先后在日本东北大学金属材料研究所和美国北卡莱罗纳州立大学物理系工作。1999 年至 2007 年任中国科学院物理研究所研究员，1999 年至 2005 年任表面物理国家重点实验室主任。2005 年起在清华大学物理系任教授，同年 11 月被增选中国科学院院士。2010 年起任清华大学理学院院长、物理系主任，2011 年起任低维量子物理国家重点实验室主任。目前是 Applied Physics Letters、Journal of Applied Physics、Physical Review B 等六个国际期刊的编委，Nano Research 和 Surface Review & Letters 的主编。

主要研究方向为扫描隧道显微学、表面物理、拓扑绝缘体和低维超导电性等。共发表学术论文 300 余篇，其中 Science 3 篇、Nature 子刊 5 篇、PNAS 1 篇、Physical Review Letters 34 篇，被引用 5300 多次。曾获中国科学院杰出科技成就奖（2005）、何梁何利科学与进步奖（2007）、国家自然科学二等奖（2004 和 2011）、第三世界科学院物理奖（2010）、“求是”杰出科技成就集体奖（2011）和陈嘉庚科学奖（2012）等荣誉/奖励。

自从 1986 年发现铜氧化物高温超导电性到今天，轰轰烈烈的四分之一个世纪过去了，但是其超导机理仍然是物理学界未解的最重要的科学难题之一。四年前铁基高温超导的发现，似乎使这一问题变得更加扑朔迷离。之所以把这些材料称之为非常规超导体，其超导机理不能用狭义的 BCS 理论解释。究竟这些“非常规超导体”非常规在哪里？有明确的办法提高超导体的超导转变温度吗？本报告将从原子尺度上异质结薄膜材料的控制生长、高灵敏度实验技术的发展与应用等方面试图回答这些（部分）问题。

二、研究領域簡介

主要研究方向为扫描隧道显微学、表面物理、拓扑绝缘体和低维超导电性等。

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Plasmonic Nanoantennas and Nanolasers

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一、演講摘要

Optical diffraction limits the spatial resolution of light focusing and guiding by conventional lenses, fibers, and waveguides to about the light wavelength. To date, this fundamental limit (Abbe diffraction limit) remains an insurmountable barrier for the modern developments of super-resolution optical microscopy,photolithography, optical data storage, and integrated photonics.

Recently, the concepts of plasmonics have been successfully applied to imaging, lithography, data storage, photovoltaics, and biochemical sensing. In the early research stage, the surface plasmon-polaritons (SPPs) excited by the incident optical wave at the planar noble-metal/dielectric interface is the main means to create surface plasmons. Later on, gold and silver nanomaterials (e.g., nanoparticles or nanorods) have been introduced to generate local surface plasmon resonance (LSPR) by visible lights.

Very recently, we have demonstrated a new paradigm to realize 0-D (dimers), 1-D (linear nanoantenna arrays), and 2-D/3-D plasmonic metamaterials (artificially structured nanoparticle composites exhibiting unusual and tunable plasmonic properties) based on large-scale self-assembly and high-precision nanomanipulation of colloidal gold and silver nanoparticles.

Using these techniques, we can control not only the plasmonic resonance over the complete visible and near-infrared spectrum range, but also the subradiant (dark) or superradiant (bright) mode. Usually, plasmonic dark modes are difficult to be studied and they hold great promise for nanoantenna and waveguide applications, such as low-loss subwavelength detection, concentration, manipulation, and transport of light. Furthermore, we have been able to demonstrate the 3-D subwavelength green plasmonic nanolaser based on hybrid III-nitride (InGaN)/noble metal (Au or Ag) metal-oxides-semiconductor (MOS) nanostructures.

The nanolaser work represents a significant step toward active plasmonic components, which are critically needed to overcome the intrinsically lossy feature of passive plasmonic components.

二、研究領域簡介

凝體、應用物理(實驗)

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Ultra High Resolution Optical Coherence Tomography and Nonlinear Confocal Microscopy Using Ultra Fast Laser

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一、演講摘要

For biomedical study new technologies help to better understand complex biological system and medical phenomena. Among more and more sophisticated equipments which are utilized to implement relevant study, ultra fast laser plays a unique role and is known as state of the art technique for biomedical imaging.

Ultra short pulse of ultra fast laser leads to broad bandwidth and short coherence length. This enables ultra high resolution in the new emerging technology, known as optical coherence tomography for micron-scale cross-sectional imaging of bio-tissue. High power of ultra fast laser may generate large nonlinearity and enable new methodology as nonlinear confocal microscopy.

In this talk, ultra high resolution optical coherence tomography will be discussed as a high potential technique in clinical diagnosis and surgical guidance. With submicron resolution optical coherence tomography can give cellular imaging and is regarded as optical biopsy in clinic. Nonlinear confocal microscopy will be also discussed as a powerful technique for biological study at molecular level, while ultra fast laser is the best light source to implement in vivo and real time imaging of living cells with large penetration depth.

Some examples will be demonstrated for ultra high resolution optical coherence tomography in clinical diagnosis and nonlinear confocal microscopy in biological study as well.

二、研究領域簡介

原子分子物理與光學及其應用--生物医学光子学

原子分子物理及光學（AMO）的方法手段，用於研究生物醫學的問題，產生了一個新的生物物理研究方向，即生物医学光子学。它将生命科学新问题和物理学的新方法以及数字信息学等多学科融合在一起，是目前快速发展的交叉研究方向之一。我们研究的重点在于无损或微创的多维、微区、高灵敏探测及光学成像的新原理和方法，及其在生物医学中的应用研究。在此基础上，将相关技术结合与集成，進行推广和应用。具体研究方向：

- 散射介质中光子扩散传播特性研究。
- 光学相干层析和多普勒成像及生物医学应用研究
- 激光相干遥感及成像技术研究
- 相干显微成像和光谱成像及应用研究
- 光纤器件、微型光机电器件和系统的应用研究

和報告內容相關的研究論文選列如下：

- “Compressed sensing with linear-in-wavenumber sampling in spectral-domain optical coherence tomography” ***Optics Letters,*** 37(15) : 3075-7, (2012)
- “Spectral-domain optical coherence tomography with a Fresnel spectrometer” ***Optics Letters***, 37(8) : 1307–9, (2012)
- “Label-free subcellular 3D live imaging of preimplantation mouse embryos with full-field optical coherence tomography”. ***Journal of Biomedical Optics*** 17, 070503. (2012)
- “Wave Front Division Interferometer Based Optical Coherence Tomography for Sensitivity Optimization”, ***Optics. Communications***. 285, 1589-1592, (2012)
- “Handheld optical coherence tomography device for photodynamic therapy” ***Chinese Science Bulletin*** 57(5) : 450-4, (2012)
- “Imaging port wine stains by fiber optical coherence tomography” ***Journal of Biomedical Optics, 15(3)***, 036020, (2010)
- “Reconstruction of complementary images in second harmonic generation microscopy” ***Optics Express***, 14(1): 4727-35, (2006)
- "Particle-Fixed Monte Carlo Model for Optical Coherence Tomography", ***Optics Express***, 13(6):2182-95, (2005)
- “How to Optimize the OCT image” ***Optics Express***, 9 (1): 24-35,(2001)

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Cold molecule and Atom-Molecule collision

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一、演講摘要：

High density ultracold rubidium molecules formed via photoassociation are investigated utilizing the absorption image of the ultracold rubidium atoms mixed with the molecules in a crossed optical dipole trap. The resonant coupling effect on the formation of the $X^1\Sigma^+{}_g$ ground state $^{85}Rb_2$ allows for a sufficient number of more deeply bound ultracold molecules, which induced an additional trap loss and heating of the co-existing atoms owing to the inelastic atom-molecule collision. This inelastic collision was used as a new detection mechanism of the ultracold molecule. The number density of the ultracold $^{85}Rb_2$ molecules in the optical trap was estimated to be $> 5 \times 10^{11}$ cm^{-3}. The temperature of Rb in the Rb-Rb_2 mixture was observed to be higher by a factor of 1.3 in comparison with the Rb only ensemble.

二、研究領域簡介：

原子分子物理 雷射物理

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相对论重离子碰撞中夸克胶子等离子体的运动学研究
Investigation of the quark-gluon plasma employing the kinetic theory

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演講者簡介

教育背景

1999.2-2004.12 自然科学博士，高能核物理，德国吉森尤斯图斯-李比希大学

1993.10-1999.1 硕士，高能核物理，德国吉森尤斯图斯-李比希大学

工作经历

2011.10 至今　清华大学物理系，Tenure-Track 副教授，博士生导师

2009.9-2011.9 德国法兰克福高等研究所，青年研究员

2005.1-2009.8 德国法兰克福歌德大学理论物理研究所，博士后

演講摘要

相对论重离子碰撞是在高温下研究夸克物质的重要实验手段。目前，在美国布鲁克海文国家实验室(BNL)和欧洲核子研究组织(CERN)的大型实验装置 RHIC 和 LHC 上进行的突破性实验强有力地表明，在碰撞实验中产生的夸克胶子等离子体是一个接近理想的流体。这一发现改变了以往人们对夸克胶子等离子体的普遍认识。报告将尝试对这一重要实验现象进行理论解释。理论研究基于应用波尔兹曼运动学方程，模拟计算在相对论重离子碰撞后产生的夸克和胶子的时空演化以及粒子之间的相互作用。研究表明，胶子的辐射过程对夸克胶子等离子体的集体流效应起了重要的作用。

研究領域簡介

相对论重离子碰撞唯象研究，输运理论，流体动力学，模拟计算

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Exploring the dynamic high energy universe with the Fermi Space Gamma-ray Telescope

江國興 Albert Kong

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一、演講摘要

With the launch of the Fermi Gamma-ray Space Telescope (Fermi) in mid-2008, we have entered a new era of high-energy astrophysics. At National Tsing Hua University, we are leading an effort of the Fermi Asian Network (FAN) to study exotic astrophysical objects using the Large Area Telescope (20MeV-300GeV) of Fermi. Together with collaborators from Taiwan, Hong Kong and Korea, not only we are the first non-NASA led Fermi team to publish papers using Fermi data, we are also very active to promote Fermi science in Asia. In this talk, I will review some of our important discoveries including gamma-ray emission of globular clusters and millisecond pulsars, the first study using Fermi of a gamma-ray binary, and studies of unidentified Fermi objects.

二、研究領域簡介

高能天文物理

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碳纳米管的研究—从生长机理到实际应用
Studies on Carbon Nanotubes -- from Growth Mechanisms to Applications

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北京清华大学物理系

一、演講者簡介

姜开利，男，1972 年出生于山东省龙口市。分别于 1995、1998、2006 年获得清华大学物理系理学学士、硕士、博士学位。1998 年留校任教，历任清华大学物理系助教、讲师、副研究员、研究员、教授。目前主要从事纳米材料的生长机理、可控生长、物性及应用研究。2008 年获国家杰出青年基金资助，2009 年获黄昆奖。

二、演講摘要

碳纳米管具有独特的一维管状结构以及优异的力学、电学、热学性能，是一种具有广阔应用前景的新材料。我们相信这样一种重要的材料一定能够得到大规模的应用，本次报告将介绍我们研究组在碳纳米管生长机理、可控生长、物性及应用研究方面所做的一些工作，着重介绍在超顺排碳纳米管阵列方面所取得的一些进展。

超顺排碳纳米管阵列是一种特殊的碳纳米管阵列，其独特之处在于可以直接抽取连续的碳纳米管薄膜. 该碳管薄膜仅有几十纳米厚，既透明又导电，其中的碳管沿抽拉方向平行排列. 如果让抽取的薄膜通过一挥发性溶剂，或者采用绞线的方式，该碳管薄膜又可以收缩成长线. 该收缩后的长线具有高的力学强度和杨氏模量，是电的良导体. 这些连续的薄膜和长线，将纳米级的碳管变成宏观可操控的客体，将碳纳米管优异的物理化学性质带到各种宏观应用，架起了一个联系纳米世界和宏观世界的桥梁，打开了一条从纳米世界通向宏观应用的道路.

本次报告还将介绍一些应用实例，包括高强度碳纳米管纤维、超级电容器和电池的电极材料、透明柔性可拉伸碳纳米管薄膜扬声器，红外探测器等。一些基于超顺排碳纳米管的产品如高分辨透射电镜微栅、触摸屏已经开始商业化进程。我们相信，在不久的将来，越来越多的基于碳纳米管的产品会逐渐走向市场。

三、研究領域簡介

1. 碳纳米管的生长机理.
2. 碳纳米管的可控合成.
3. 碳纳米管的物性研究.
4. 碳纳米管的应用研究.

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Decoherence in an Aharonov-Bohm Interferometer

陳正中 Jeng-Chung Chen

Department of Physics, National Tsing Hua University, Hsinchu, Taiwan

一、演講摘要

This talk is about the studies of quantum dephasing mechanism of a ballistic quantum ring, and the implications of our results in operating quantum electronics. Finally, few ongoing works in our group will be briefly introduced.

二、研究領域簡介

低維度半導體量子傳輸物理現象, 主要包括單電子電晶體的傳導特性，量子線，量子干涉元件。

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The Second Harmonic Generation of Picosecond Pulses base on Duo-Stage Ytterbium-Doped Fiber Amplification

Chih-Hsuan Lin [1] (林志軒),Feng-Hua Tsai [1,a] (蔡鋒樺), Yi-Jing You[1] (游宜靜),Alexey Zaytsev[2] (蔡澤夫), Chi-Luen Wang [3](王啟倫), and Ci-Ling Pan[1,2,b](潘犀靈)

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Nowaday, LED manufacturers need Q-switched laser or diamond blade to do wafer scribing. However, diamond tools are expensive and are used up rapidly. By using Q-switched laser, the precision of processing is smaller than 100 μm and is better than the diamond scribing. But the peak power of Q-switched laser isn't high enough to reach the ablation threshold. To get better performance of material processing, high power picosecond laser source is needed. With shorter pulse width and higher peak power, it's easier to reach ablation threshold. Wavelength is another key factor in processing. Green or ultraviolet laser source is widely used for specific material, Sapphire and GaN. In this reasearch, by using type-I critical phase matching in Lithium Triborate (LBO), we demonstrate second harmonic generation of a high-power picosecond ytterbium-doped fiber laser system.By optimizing focal length of fucusing lens and polarization state of the fundamental light at 50 W, we generate 5.5 W of the green output.

References:

[1] D. A. Kleinman, A. Ashkin, and G. D. Boyd, "Second-harmonic generation of light by focused laser beams," Phys. Rev., vol. 145, no. 1, pp. 338-379, May. 6, 1966.

[2] G.D. Boyd and D.A. Kleinman, "Parametric interaction of focused gaussian light beams," J. Appl. Phys., vol. 39, no. 8, pp. 3597-3639, Jul. 1968.

Ultrafast Carrier Dynamic and Terahertz Conductivity of Indium-Tin-Oxide Nanostructure

Chan-Shan Yang[1], Chan-Ming Chang[1], Jia-Min Shieh[2],Peichen Yu[3] and Ci-Ling Pan[1*]

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We study the carrier dynamic and frequency-dependent complex refractive indices and conductivities of ITO thin films, nanorods, and nanowhiskers by THz time-domain spectroscopy (THz-TDS). In order to obtain the complete optical and electrical information, we combined the experimental results of complex refractive indices measured from the PC antenna (0.15-1.4THz) and laser-induced gas plasma (0.5-4THz) THz-TDS system. Because the complex conductivities can be extracted from the refractive indices, the important electrical parameters for optoelectronic materials, such as DC mobilities and carrier densities fit complex conductivities of the ITO thin films, nanorods, and nanowhiskers by Drude-Smith model, will be much more accurate. We have determined that the plasma frequencies of the ITO films are in the range of 1547-3170 rad·THz, while the corresponding scattering times are 4.32-9.19 fs. For nanowhiskers and nanorods, the plasma frequencies are 751-853 versus 561-1006 rad·THz, and carrier scattering time are 13.2-39.6 versus 13.5-31.7 fs, respectively.

A high-power picosecond laser based on master oscillator fiber amplifier system

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Ultrafast pulses at high average powers are useful in numerous application areas including industry micromachining, nonlinear frequency conversion, medical application, and fundamental science. The system based on fibers is an attractive technology for compact, robust, and reliable ultrashort-pulse sources. Thus, fiber laser and amplifiers are more interesting for recent researches.

In this research, we designed, constructed and characterized a high-power master oscillator power amplifier (MOPA) system using a dual-stage ytterbium doped fiber amplifier. We can achieve over 60 W output power of 1064 nm signal with 80% optical conversion efficiency. The amplified pulses exhibit excellent beam quality. The experimental results are in good agreement with theoretical and predictions.

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The X-ray population study in the spiral galaxy M101

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We report the preliminary result of our X-ray population study on the face-on spiral galaxy M101 using the 1Msec Chandra observation. By cross-checking the 1Ms Chandra X-ray image and the corresponding Hubble Space Telescope (HST) data, we would be able to identify some optical counterparts for the X-ray sources.

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Neutrino masses via the Zee mechanism in the 5D split fermion model

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We study the original version of the Zee modelin the framework of the split fermion model in 5D space-time. The neutrino masses are generated through 1-loop diagrams. By assuming an order one anarchical complex 5D Yukawa couplings, all the effective 4D Yukawa couplings are determined by the wave function overlap between the split fermions and the scalars in the fifth dimension. The predictability of the Yukawa couplings is in contrast to the original Zee model in 4D where the Yukawa couplings are unknown free parameters. This setup exhibits a geometrical alternative to the lepton flavor symmetry. By giving four explicit sets of the split fermion locations, we demonstrate that it is possible to simultaneously fit the lepton masses and neutrino oscillation data by just a handful free parameters without much fine-tuning. Moreover, we are able to make definite predictions for the mixing angle θ_{13}, the absolute neutrino masses, and the lepton flavor violation processes for each configuration.

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A model for Neutrino Masses and Dark Matter with the Discrete Gauge Symmetry

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A standard model extension with an extra U(1) gauge symmetry and extra degree of freedoms is suggested. The U(1) gauge group is assumed to be spontaneously broken by a EW singlet scalar at energy scale around TeV, thus active neutrino can generate sub-eV masses via a loop correction. The broken U(1) leaves a residual Z2 discrete symmetry and protects the lightest new degree of freedoms from decaying, thus the model offers candidates of Cold Dark Matter (CDM). All the new degree of freedoms is expected as heavy as TeV hence the model is testable through Particle Collider (ie. LHC).

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Towards the Absolute Calibration of the Molecular Iodine Reference Line for Muonium 1S-2S Spectroscopy

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A muonium atom is a bound state formed by a positively charged muon (μ^+) and an electron (e.g. see Chap. 1 in Ref. [1] for an overview), which provides a structureless two-body leptonic system where quantum electrodynamics can be calculated precisely. The 1S-2S transition of a muonium atom has been probed with Doppler-free two-photon spectroscopy yielding a muon-electron charge ratio of $-1-1.1(2.1)\times10^{-9}$ [2]. The resolution of this experiment was limited by (a) the flux of muon beams, (b) the discontinuous (pulsed) light source, and (c) the precision of the reference line. The recent improvement in the vacuum muonium yield utilizing porous silicon technology demonstrates a promising route to increase the muonium-photon interaction time and hence alleviating limitations (a) and (b) [3]. In this poster, our progress at NTHU to establish a new reference standard for the muonium 1S-2S spectroscopy is presented. Our goal is to resolve the limitation (c) mentioned above.

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Photonic Synthesis of MMW Generation at W-Band with Reconfigurable Chirp Control

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We propose and demonstrate a photonic approach to realizing chirped millimeter-wave (MMW) generation with large frequency tunability. This technique is based on spectral pulse shaping combined with linear frequency-to-time mapping (FTM) [1]. Particularly, the proposed terahertz time-domain spectroscopy (THz-TDS) method allows one to measure the high-frequency MMW waveforms in free space. By properly designing the spectral filtering function, a large time-bandwidth product (TBWP) MMW arbitrary waveform with the desired frequency chirping rate can be generated. This scheme can find wide applications such as modern radar, ultrafast wired and wireless communications.

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High-energy Yb:doped dispersion-mapped fiber oscillator in controllable noise-like operation regime

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We report on the generation of tunable high-energy noise-like pulses with super-broadband spectrum from a Yb-doped dispersion-mapped fiber ring laser. The maximum 3-dB spectral bandwidth of the noise-like pulses is about 48.2 nm with the output energy is as high as 45 nJ, limited by optical damage of the components. The use of negative dispersion delay line and the spectral filter are found to be important for such high-power noise-like operation. The central wavelength of the noise-like pulses can be tuned easily over ~ 12nm. The bandwidth and duration of the generated wave packets can also be controlled. Experimental results are in good agreement with theoretically simulated results.

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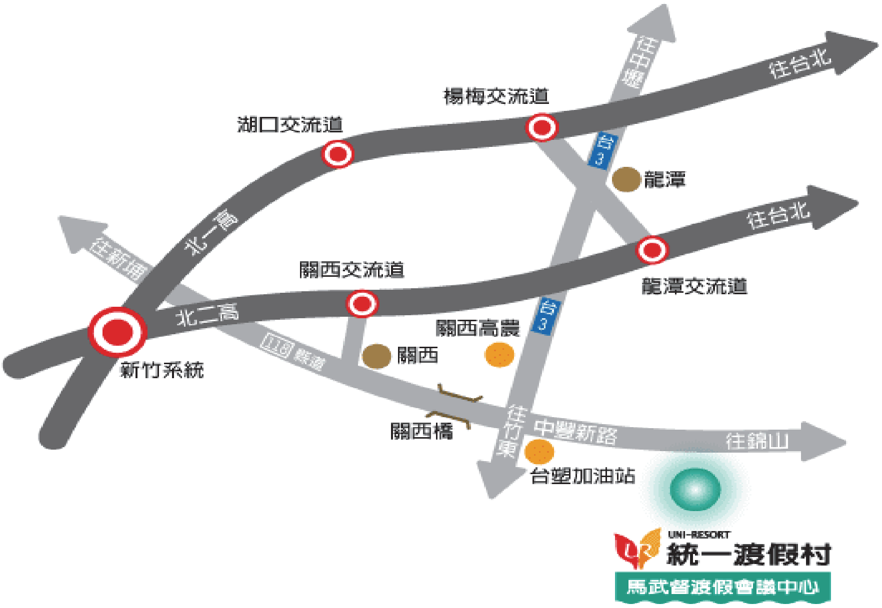
地圖(交通/會場)



新竹統一馬武督渡假會議中心

Address: 新竹縣關西鎮金山里 4 鄰 34 號

座標： 24°46'0.63"N 121°13'3.93"E

新竹統一馬武督渡假會議中心交通資訊：

統一馬武督渡假會議中心位於新竹關西 118 縣道 32 公里處，距台北市區僅約 1 小時 40 分的車程，建議行駛國道三號(北二高)於關西交流道(關西/新埔)出口下交流道後左轉正義路行駛 118 縣道，途經明德路→中豐路→羅馬公路直行於 32 公里處右轉即可抵達。(下交流道後約 20 分鐘車程)

※若行駛國道一號(中山高)：

北上—於新竹系統(往竹東方向)接至國道三號，後於關西交流道(關西/新埔)出口下交流道後左轉正義路行駛 118 縣道，途經明德路→中豐路→羅馬公路直行於 32 公里處右轉即可抵達。

南下—請於平鎮系統靠右朝大溪/觀音方向行駛於大溪方向接至台 66 線，直行台 66 線於大溪交流道上國道三號，後於關西交流道(關西/新埔)出口下交流道後左轉正義路行駛 118 縣道，途經明德路→中豐路→羅馬公路直行於 32 公里處右轉即可抵達。(或行駛台 66 線於中豐路右轉直行 113 縣道，朝關西方向右轉省道台 3 線並直行至 118 縣道左轉，續行至 32 公里處右轉即可抵達)

馬武督渡假會議中心休閒設施與開放時間一覽表

新竹統一馬武督渡假會議中心設有體適能中心、健康檢測區、山泉水游泳池、高空踏踏樂、滑草場、健身房韻律區、溫水游泳池、假日電影院、全家歡樂堡、高爾夫揮桿場等各式休憩設施。除了豐富的設施外，專為會議而配備現代化視聽器材也一點都不含糊，如超大銀幕、影碟機、投影機、音響等等，且兼具電影院及演藝廳功能，儼然五星級會議中心。在這裡燥肅的會議轉化成渡假進修的天堂。

體適能中心主要有兩大功能：

一、體能年齡檢測—標準的體適能檢測設備，能幫您做體能年齡的檢測，讓會員在完善的健身設施中，選擇對自己最有效的健身設施。

二、運動處方—運動與吃藥一樣，要對症下藥，我們會根據會員的體能狀況，由專業教練依人體體能評估，設計運動處方，不但讓您事半功倍，而且避免運動傷害，讓您隨時維持最佳體能。

【設施開放時間表】

域別	設施項目	週日至週四	週五、六	備註
渡假大樓二樓	會員貴賓區	07:00~21:00	07:00~22:00	會員卡登記使用
	溫水游泳池	07:00~21:00	07:00~22:00	每日中場清潔整理 午場 12:30~13:30 晚場 17:30~18:30
	男女三溫暖	07:00~21:30	07:00~22:30	
	童玩區	07:00~21:30	07:00~22:30	4 歲以下需成人陪同
	健身房	07:00~21:00	07:00~22:00	渡假大樓 2F 櫃檯預約
	撞球、桌球	07:00~21:00	07:00~22:00	
一樓	假日電影院	週五放映時間 19:30 一場 週六至週日放映時間 14:30 與 19:30 各一場		
左岸區	氣動槍	週一至週五 採預約報名	週六至週日 11：00~12：00 16：00~17：00	※平日限 10 人以上預約報名，於前一日二樓櫃檯預約方可使用。 假日請於開放時間現場預約報名每人 100 元/局
	KTV 歡唱(二樓)	週一至週五 19:00~24:00	週六至週日 14:30~17:30 19:00~24:00	200 元/人(會員八折) 另加一成服務費

會場相關資訊

域別	設施項目	週日至週四	週五、六	備註
戶外區	射箭場	每日開放 09：00~10：30 14：00~15：30		設施現場報名使用 ※如天候不良，暫停開放
	踏踏樂	每日開放 11：00~12：00 16：00~17：00		
	滑草體驗場	07:00~22:00	07:00~23:00	設施現場排隊使用
	綜合球場	07:00~17:30	07:00~21:00	渡假大樓 2F 櫃檯預約
	高爾夫揮桿場	07:00~17:30	07:00~17:30	
	漆彈場	週一至週五 採預約報名	週六至週日 09：00~10：30 14：00~15：30	※平日限 10 人以上預約報名，於前一日二樓櫃檯預約方可使用。 假日請於開放時間現場預約報名每人 100 元/局
	滑水道	週六至週日 開放使用	09：00~17：00	※如天候不良，暫停開放 設施 9/12 日前開放
	戶外泳池			

更多資訊請參見馬武督渡假會議中心網址：http://clubhealth-mwd.hotel.com.tw/facilities.asp