國家同步輻射研究中心

出國心得報告書

出國人姓名：徐嘉鴻、陳俊榮、許火順、湯茂竹、賴麗珍等 15 人

出國日期：2019/12/16 - 2019/12/21

目的地(國家、城市)：新加坡

參加會議名稱：第 16 屆亞洲結晶學會議

一、 參加會議經過

16th Conference of the Asian Crystallographic Association (2019 AsCA)於 2019 年 12 月 17-20 日假國立新加坡大學(National University of Singapore)舉行，中心同仁分批前往，本人一行於 12 月 16 日上午出發，20 日參加閉幕典禮後於 21 日返台。

此次會議總計有來自以亞洲、大洋洲學者及學生為主的近 500 位與會者，此外亦有約 50 位來自歐洲與美洲的學者。根據大會資料韓國和印度有 60 多位與會者，中國大陸加香港和地主國新加坡各有 50 多位與會者，日本則為最多與會人員的國家。台灣則有本中心同仁加上來自其他單位如中研院、台大、清大、師大、暨南大學等教授學者，有近 30 人員參加。大會也特別報告與會者當中約有 1/3 為女性。這次會議總計有約 250 篇海報發表，另有 170 多個口頭報告。

此次參加會議除了個人報告設施發展近況或研究結果，另一目標是爭取 2022 AsCA 主辦權。除了中心代表台灣爭取之外，另外韓國也爭取在濟州島辦理。兩國代表於 12 月 18 日於 AsCA Committee Meeting 中提出規劃報告，除了議程、會場、交通、住宿、飲食、報名費等細節外，值得注意的是有 committee 委員詢問 organizing committee 中女性成員的比例，此議題近年數次在國際會議中被提起，可做為未來籌備爭取主辦國際會議時的考量點之一。大會於 19 日由各國代表投票決定 2022 主辦國，很遺憾由韓國取得主辦權。

台灣團隊在爭取會議前夕，包括王素蘭教授等人努力整理資料。

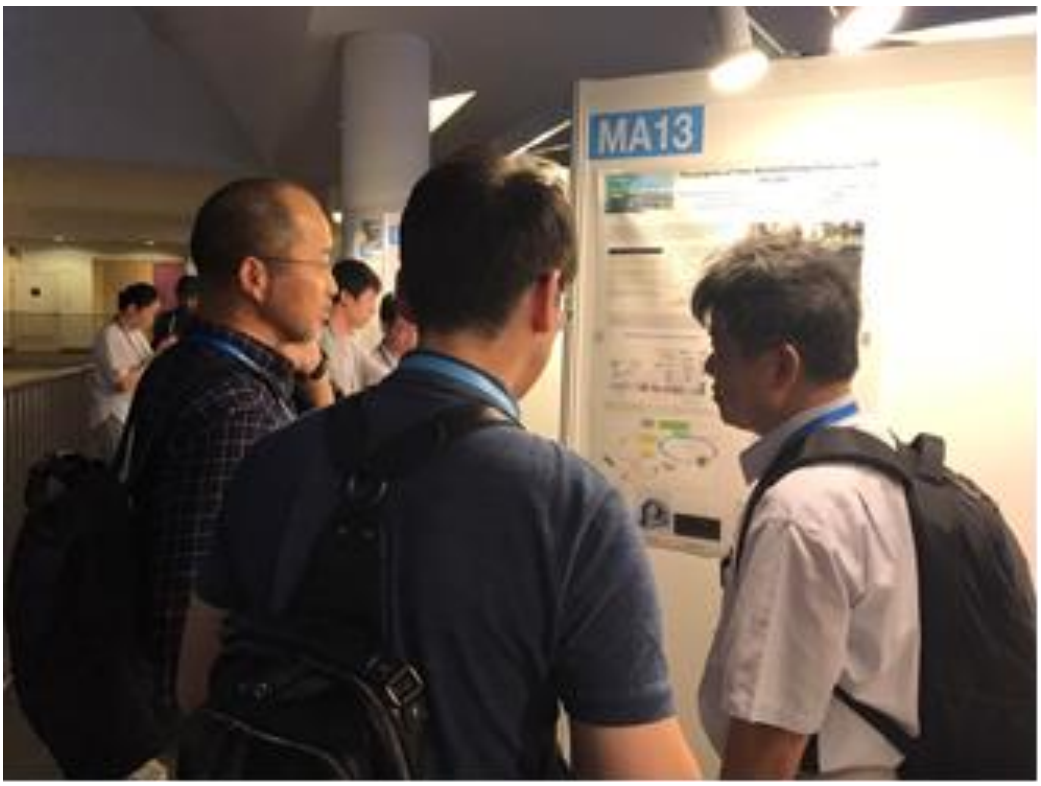
此次會議主題可分成 3 部分 第一為大分子(macromolecular crystallography)與生物結構為最大宗，其二為化學結晶學(Chemical Crystallography)，第三為材料與應用(Materials and Applications)。三位大會 plenary speakers 一位是來自韓國 Korea Research Institute of Bioscience and 的 Dr. Myunghee Kim 報告為微生物引起疾病的機制及後續之免疫調整的角色探討;另兩位都是化學晶體學，分別是 metal-organic frameworks (MOFs)和 covalent-organic frameworks (COFs)領域的知名學者，分別是 Kyoto University, Institute for Advanced Study 的 Prof. Susumu Kitagawa 和 National University of Singapore, Department of Chemistry 的 Prof, Donglin Jiang，他們利用簡單的化學結構建置成結構複雜的 2D 或 3D 的孔洞性結構，由結構的設計到功能性的應用，好似在堆積木，讓我們這些外行人歎為觀止。MOF 和 COF 分別是金屬有機骨架和純共價鍵結有機骨架化合物，已蓬勃約 20 年，仍然具有很大研究群，顯示歷久不衰。能源材料的研究並沒有想像

的多，或許著重點在材料與功能，或許是另有更多專門討論能源材料的會議，因此 AsCA 會議相對來的較少。實驗設施和設備的發展大致被歸類在第三個主題，此領域的與會者相對較少。此行了解目前國際上結晶學相關研究的趨勢，獲益良多。

二、 與會心得

此次會議於第一天下午安排一個半小時,分 3 個領域平行進行 Flash presentations by students/early career researchers。參加對象為有海報展出的 32 歲以下的學生、博後或年輕學者,每位報告人利用 3 分鐘的時間用一張投影片說明海報的重點，時間控制、科學概念及報告的清晰度是評審的評分重點，這種報告對報告人是一很好的訓練，在很短的時間內報告重點，吸引觀眾的注意；而對觀眾而言，可以很方便快速瞭解報告主題內容，作為進一步觀看海報討論的選擇，值得未來辦理會議時參考嘗試。較遺憾的是在此次 48 位參加者中沒有來自台灣的與會者參加此項 Flash presentation，可能因為此次參加者多為較資深的學者和研究人員。

此次主辦單位未提供各報告的摘要電子檔，也未列印海報的題目清單，交通指引亦不明確，讓與會者感到十分不便，我們宜引以為戒。



壁報展示時，與會學者來看壁報與討論。

三、 建議

值得注意的是近年來發展迅速的 cryoEM，其實驗方法和研究結果在約 20 個

microsymposium 中即佔 2 個，吸引許多聽眾。報告中可看出實驗技術仍在快速發展，幾個報告人都是來自規模可觀的顯微術中心，結合樣品製作、熟悉各種電子顯微鏡的操作模式的技術人員，以及數據模擬等不同專長的研究人員和科學家共同組成團隊合作，目前尚未達到 routine operation 的階段，國內應集中人力物力建立一顯微術中心，或是較理想且具有競爭力的做法。

四、 附件

Poster MA19 摘要及壁報展示:

摘要

Abstract

SG-ASCA1373

The progress of Time Resolved Pump-Probe Facility at TPS 09A

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Abstract Body:

TPS 09A is a temporal coherent X-ray beamline at Taiwan Photon Source (TPS). It is designed for time-resolved laser pump X-ray probe experiments. TPS is a third generation synchrotron source which operate at 3.0 GeV, 500 mA, with beam emittance of 1.6 nm rad and open to users since 2016. The source of TPS 09A beamline is delivered from IU22 undulator which provide X-rays from 5.6 keV to 25 keV. Inside the hutch, the X-ray refocus by a compound reflection lens which focus X-ray beam down to 20 micron. The Juelich chopper has been installed at the front of 9-circle diffractometer in July 2019. The commission of Juelich chopper is very smooth. The chopper can read the TPS RF clock and the TPS reference TTL (578 kHz). When measuring with the APD, it is possible to see three signals on the oscilloscope. The time scale of the scope has to be at 200 μs per division to see the three signals simultaneously which are about 330 μs apart. When moving to slightly lower x-values, two of the signals fade away. The one signal which is thereby left is from the chopper side with the channels. By iteratively shifting the chopper phase and zooming the scope time scale it is possible to find the proper chopper phase for the channels. The selection of isolate bunch from hybrid mode operation is within the design goal. A Ti-Sapphire with 35 fs pulse laser is located at the second hutch and can bring the 800 nm or 400 nm pulse laser to sample position. The synchrotron X-ray bunch duration is about 35 ps. The testing experiments of the excited sates of luminesce compounds are under investigations.

壁報展示

The progress of Time Resolved Pump-Probe Facility at TPS 09A

Hwo-Shuenn Sheu, Wei-Rein Liu, Yin-Yu Lee, Ying-Yi Chang, Yi-Wei Tsai, Kuan-Li Yu, Chia-Hung Hsu, Yi-Chih Liu, Kuo-Tung Hsu, Shih-Lin Chang
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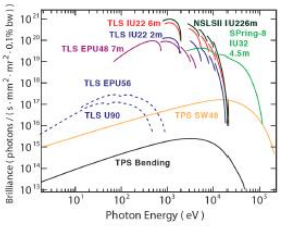
Taiwan Photon Source (TPS) is one of the most brightness 3rd generation synchrotron ring. TPS 09A is designed for temperately coherence X-ray diffraction beamline which delivery X-rays from 5.6 keV to 25 keV from two IU22 undulators and open to users since 2016. Below is the basic ring parameter of the 3GeV TPS and its brilliance compares to NSLS-II and SPring-8.

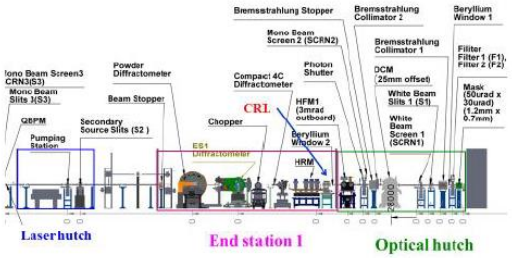
TPS parameters	
Energy [GeV]	3.0
Current [mA]	500
Circumference [m]	518.4
Natural horizontal emittance [nm • rad]	1.6
Critical energy of bending magnets [keV]	7.13
Cell units	24 DBA
Superperiods	6
Radiofrequency [MHz]	499.654
Straight sections	12m x 6 7m x 18



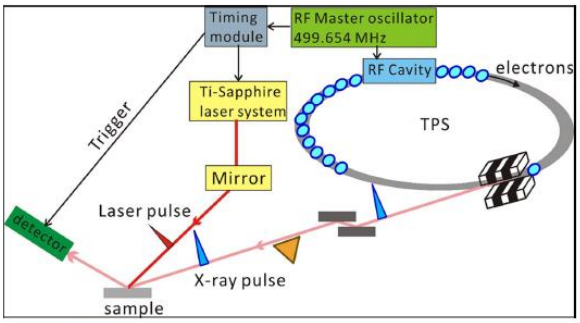
BRILLIANCES OF TPS, NSLS-II, AND SPRING-8

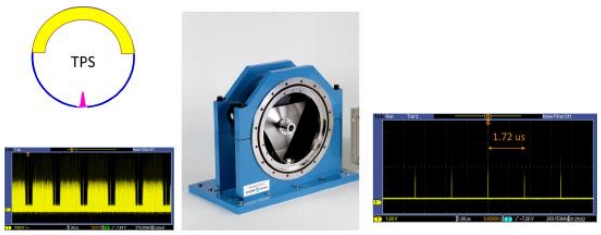
TPS 09A layout is shown below. A set of compound refraction lens have been installed before HRM. The X-rays can be focus down to 30 micron meter with a compound reflection lens (CRL). A **Juelich chopper** has been installed right after HRM that can select isolated bunch X-rays out of the hybrid mode. The hybrid mode operates at 500 mA with the isolated bunch of 1.03 mA.

TPS 09A Beamline Layout and Current Status

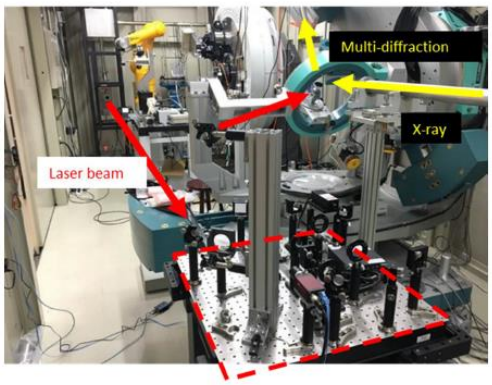


The spectrum of hybrid mode. Each bunch length is about 30 picosecond. A clean space for isolated bunch and multi-bunch is 200 nsec on each side. In single bunch mode, the current is ~2 mA while isolated bunch current of hybrid mode is ~0.6 mA.

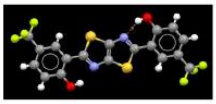


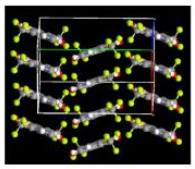


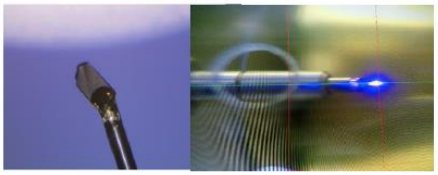
Hybrid Mode | Juelich chopper | Isolated bunch

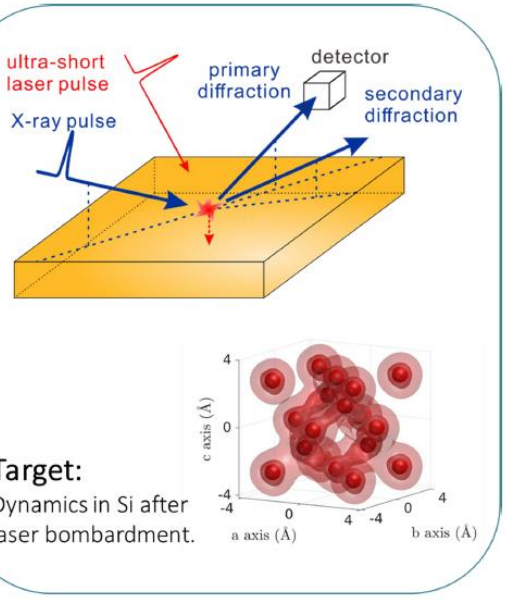


CF_3-HTTH crystal structure









Acknowledgements:
Thanks Prof. B.T. Chou of NTU, Taiwan for providing single crystals and thin films samples. $ NSRRC & MOST