

「光・量子融合連携研究開発プログラム」第8回全体会議

XTOP 2014 参加報告

14th - 19th September 2014
Villard de Lans, France

12th Biennial Conference
on High-Resolution X-Ray Diffraction
and Imaging



XTOP 2014

2014年9月30日

(株) リガク・虎谷秀穂

XTOPとは？

XTOP = High Resolution X-ray Diffraction and Imaging

2年に一度開催

開催当初の話題：
Topography
2- and 3- crystal
diffractometry
Reflectometry
Standing waves

今年はフランス・
グルノーブル近郊
の村
参加者 ~ 200名

開催年	開催都市	開催国
1992	Marseille	France
1994	Berlin	Germany
1996	Erice	Italy
1998	Durham	U n i t e d
2000	U s t r o n	Kingdom
2002	-Jaszowiec	Poland
2004	Aussois	France
2006	Prague	Czech Republic
2008	Baden-Baden	Germany
2010	Linz	Austria
2012	Warwick	U n i t e d
	St Petersburg	Kingdom
		Russia
2014	Villard de Lans	France
2016	Brno	次回はチェコ共和国

ヨーロッパ中心の
会議

USA から invite

最近の話題：
Diffractometry
Reflectometry
Standing waves
Coherent and
conventional x-
ray diffraction
imaging and
topography
Phase contrast
imaging
(radiography
and micro-
tomography)

Sponsorship

X線装置
メーカー

光学系
・線源

検出器

アクチュ
エータ等、
部品

公的機関



Scientific Sessions

Sunday 14	Monday 15	Tuesday 16	Wednesday 17	Thursday 18	Friday 19
	Guizar-Sicairos	Gustafson, Boule, Marchenkova, Pietsch, Renaud	Carbone, Grigoriev, Letoublon, Slobodskyy, Hilhorst	Holt, Dupraz, Elzo, Etzelstorfer, Stankevici	Cloetens, Scheel, Hodeau, Tanner, Wormington
	Coffee break				
	Ludwig	Coffee break	Coffee break	Coffee break	Coffee break
	Short break				
	Babonneau	Tsoutsouva, Danilewsky, Haenschke, Lafford	Kirchlechner, Leclere, Sanchez, Van Petegem	Olivo, Lovric, Symes, Weinhausen	Barty, Manfreda, Roth, Vartaniants
	Companion School Lunch @ ESRF	Lunch	Lunch	Lunch	Concluding remarks
XTOP Companion School	Barret	Industrial clips		Lauridsen, Chen, Collins, Targonsky, Zaumseil	Bus to Grenoble
	Bus to Villard de Lans				
	Short break				
	Registration	Poster session 1	Free Time, Hiking, Excursion,...	Coffee break	
	Baumbach				
	Tea break				
	Opening	Coffee break		Van de Kamp, Modregger, Philip, Mangelick-Noel	
	Zaumseil	Holy, Grenzer, Hayashi, Grzanka, Zdora			
	Diaz, Mastropietro, Shabalin, Wilke, Chahine				
	Companion School Dinner @ ESRF		Poster session 2+ buffet diner		
	Authier		XTOP closed committee meeting		
		Dinner		Banquet	
	Welcome cocktail		Tafforeau		



招待講演@ XTOP 2014

講演タイトル

X-ray ptychography: from technique development to applications

High-energy surface X-ray diffraction applied to model catalysis

Defect characterization of “mono-like” silicon for photovoltaic applications using quantitative X-ray diffraction imaging

X-ray Nanobeams : a great tool for nanoscience

In situ micromechanics: An overview on μ -Laue based experiments

Strain imaging of nanoscale semiconductor heterostructures with x-ray Bragg projection ptychography

Current state of development and future perspectives of edge-illumination x-ray phase contrast imaging

Diffraction Contrast Tomography on a 3-D Laboratory X-ray Microscope

Time-resolved *in vivo* tomography for tracking morphological dynamics

X-ray nano-tomography through nano-focusing

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Current state of development and future perspectives of edge-illumination x-ray **phase contrast imaging**

Diffraction Contrast **Tomography** on a 3-D **Laboratory X-ray** Microscope

Time-resolved ***in vivo* tomography** for tracking morphological dynamics

X-ray **nano-tomography** through nano-focusing

論じられたイメージングの主な手法@ XTOP

手法	使用線源	解析例
Coherent X-ray diffraction imaging 	XFEL (coherent X-rays)	孤立粒子 (タンパク分子)
Ptychography 	SR (coherent X-rays)	生体物質 生体鉱物
High-energy surface X-ray diffraction	SR (up to 85 keV)	半導体材料
HRXRD, GIXRD, GISAXS, μ -Laue	SR, Lab-X	半導体材料 NW, ND
Phase contrast imaging	SR, Lab-X	生体物質
Topography	SR, Lab-X	半導体材料 (Si, GaAs)、構造不整
Tomography	SR, Lab-X	生体物質、昆虫
Diffuse scattering	SR, Lab-X	構造不整
XRF hologram	SR	強誘電体

XFEL = X-ray Free Electron Laser

SR = Synchrotron radiation

Lab-X = Laboratory X-ray

Laser based X-ray phase contrast imaging for medical Appl.

UK Research Group consisting of:

Central **Laser** Facility, Rutherford Appleton Laboratory, Harwell Oxford, UK

The John Adams Institute for **Accelerator** Science, Imperial College London, UK

GoLP/Centro de Fisica dos **Plasmas**, Instituto Superior Tecnico, Lisboa, Portugal

Faculty of Medicine, Department of Surgery & Cancer, Imperial College London, UK

Imperial College Healthcare NHS Trust, London, UK

MRC Mammalian Genetics Unit, Harwell Oxford, UK

その他のグループ：

SCAPA (Scottish Center for the Application of Plasma-based Accelerator) (UK)

CALA = Center for Advanced Laser Application (Germany)

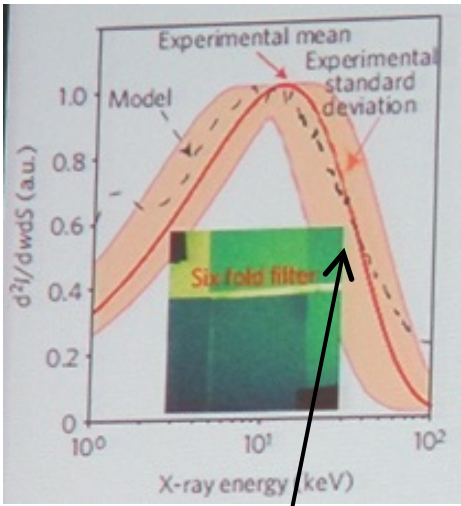
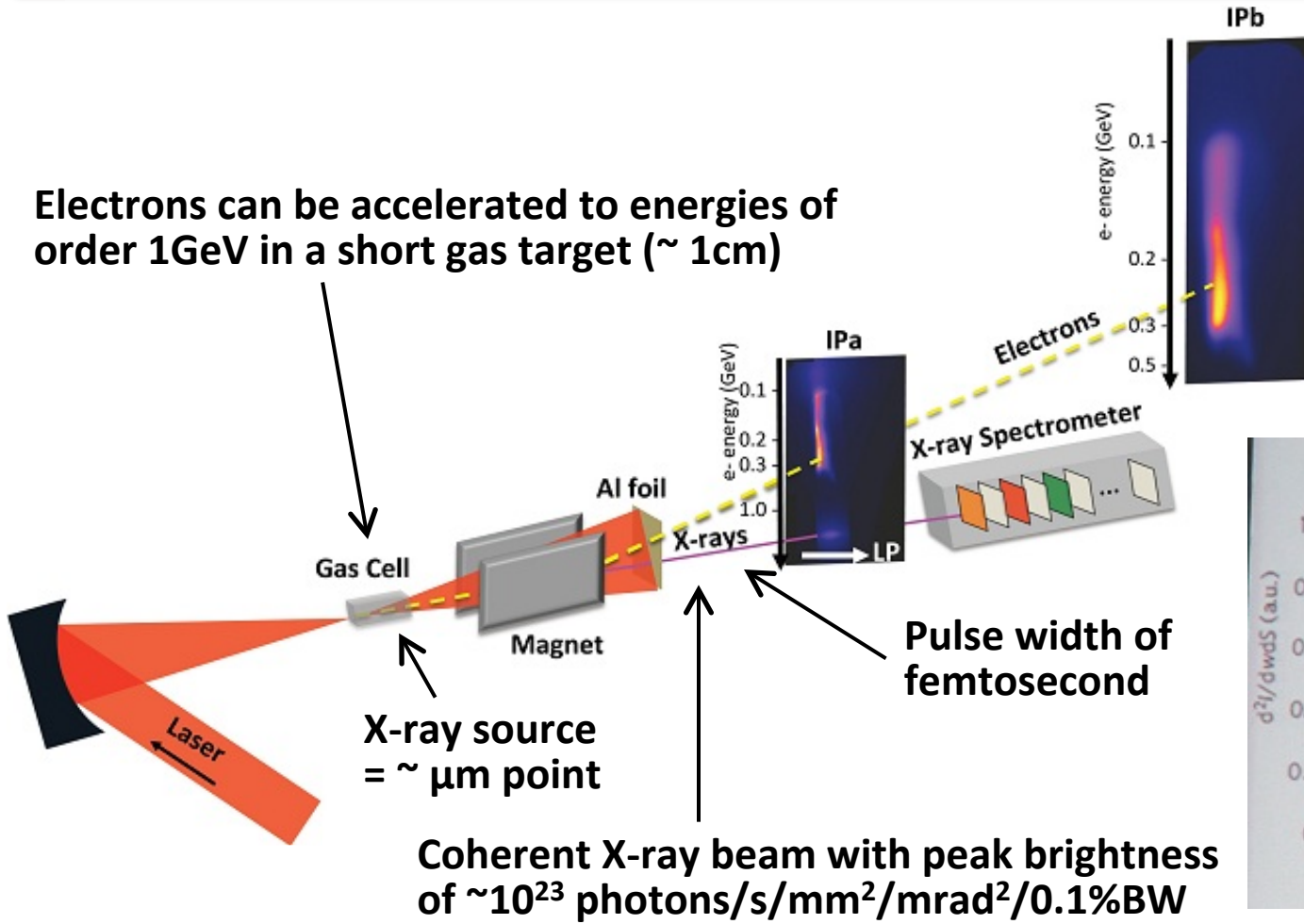
BELLA = **BE**rkeley **L**ab **L**aser **A**ccelerator@Lawrence Berkeley National Laboratory
(USA)

Lawrence Livermore National Laboratory (USA)

And others

Laser based X-ray phase contrast imaging for medical Appl.

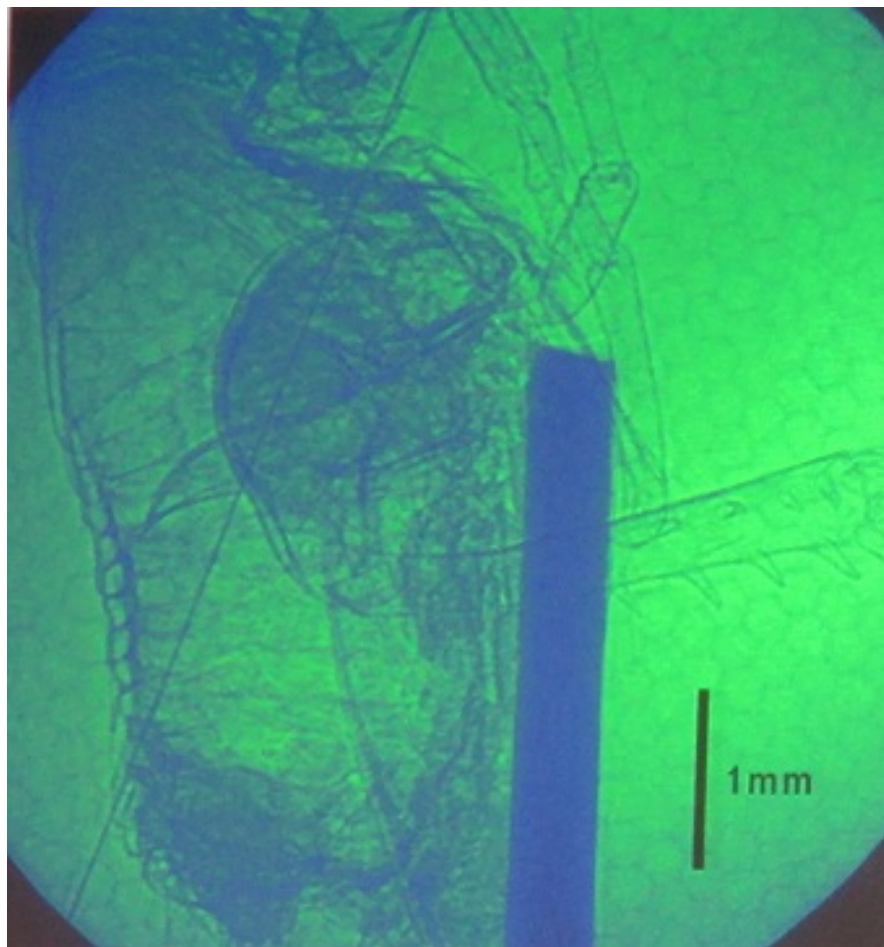
Electrons can be accelerated to energies of order 1GeV in a short gas target (~ 1cm)



Process of laser plasma wake-field acceleration

30 keV @1/2

Laser based X-ray phase contrast imaging for medical Appl.



Propagation phase contrast imaging
of insect

現状、問題点

GEMINI @ CLF は 1 shot/20 second

BELLA @ LBLで1 shot / second



近々の計画 (High rep-rate PW-class)

GEMINI extension @ CLF (UK)

PW operation @10Hz

SCAPA (Scottish Center for the Application
of Plasma-based Accelerator) (UK)

200-300TW@5Hz, 40TW@10Hz,
sub-TW@1kHz (2014)

Field of view = few mm
Resolution ~ μm
Single acquisition

IUCr 2014 参加報告



Canadian National Committee
for Crystallography (CNCC)



National Research
Council Canada

Conseil national
de recherches Canada

23rd

CONGRESS AND GENERAL ASSEMBLY
OF THE INTERNATIONAL UNION OF CRYSTALLOGRAPHY
CONGRÈS ET ASSEMBLÉE GÉNÉRALE
DE L'UNION INTERNATIONALE DE CRYSTALLOGRAPHIE

AUGUST 5 - 12 AOÛT 2014 MONTREAL, QUEBEC, CANADA

WELCOME

BIENVENUE



会議の正式名称：23rd Congress and General Assembly of the
International Union of Crystallography (IUCr 2014)

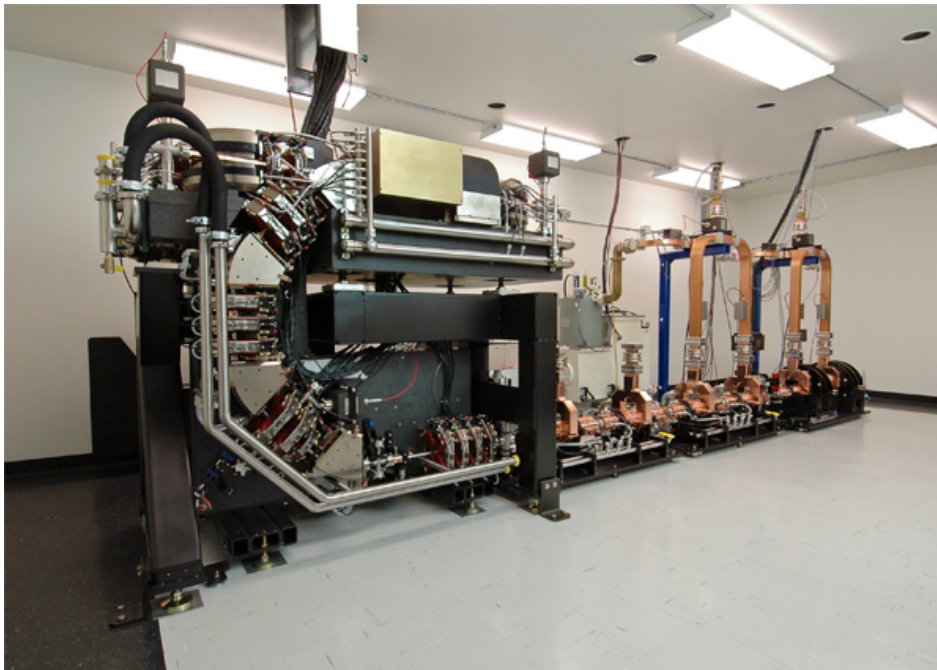
開催期間：2014/8/5 – 8/12

開催地：Montreal, Canada

会場：the Palais des congrès de Montréal

@commercial booth of Lyncean Technologies

リンセオンテクノロジーのCLS (Compact Light Source) が、ミュンヘンの大学に1台売れているとのこと。目的は、科学研究で、X-ray Imaging とのこと (from a sales woman of Lyncean Tech.)

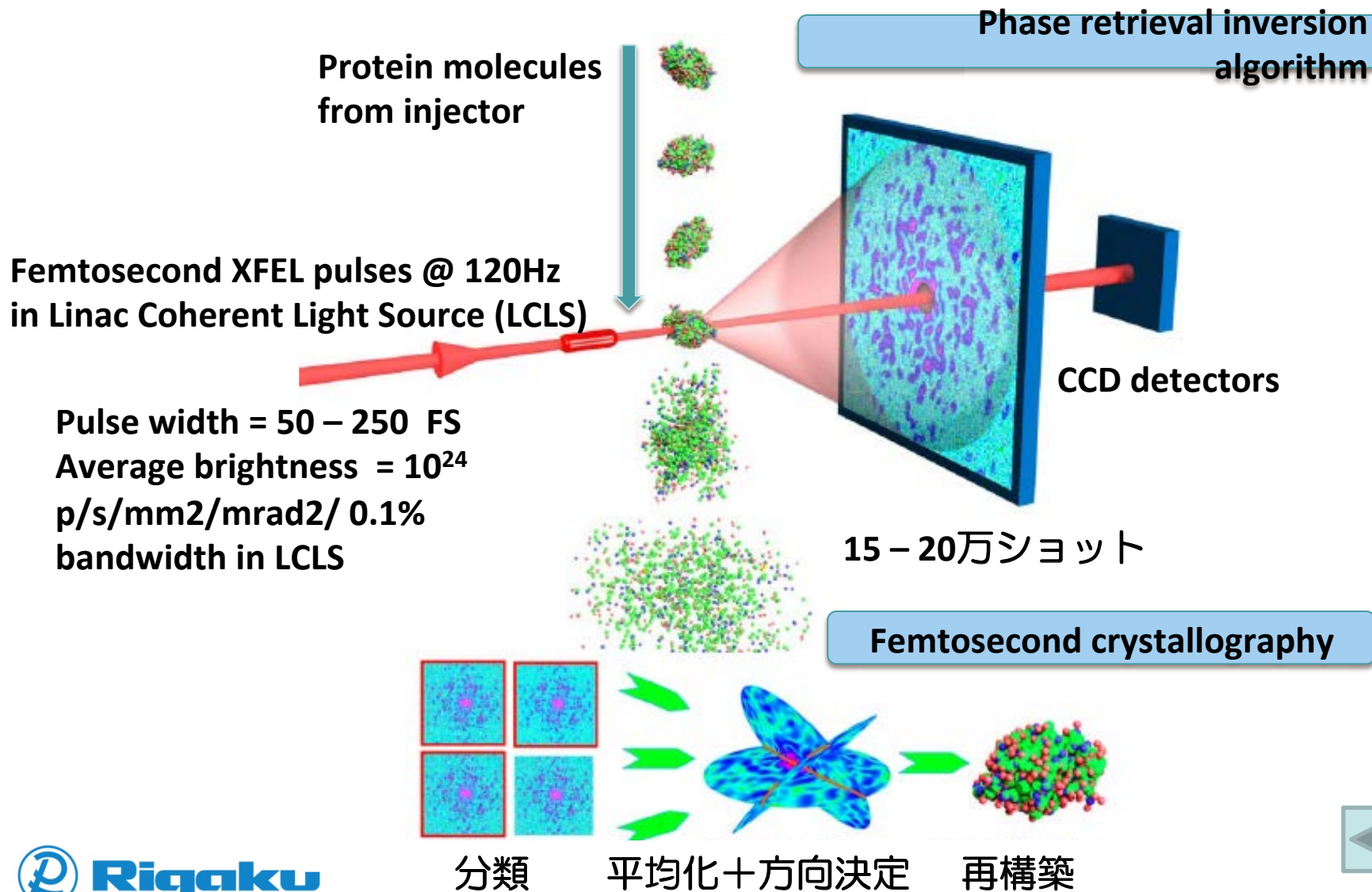


Lyncean has experience building two complete, operational CLS devices and is presently completing a CLS for delivery to its first customer. (March 2014)

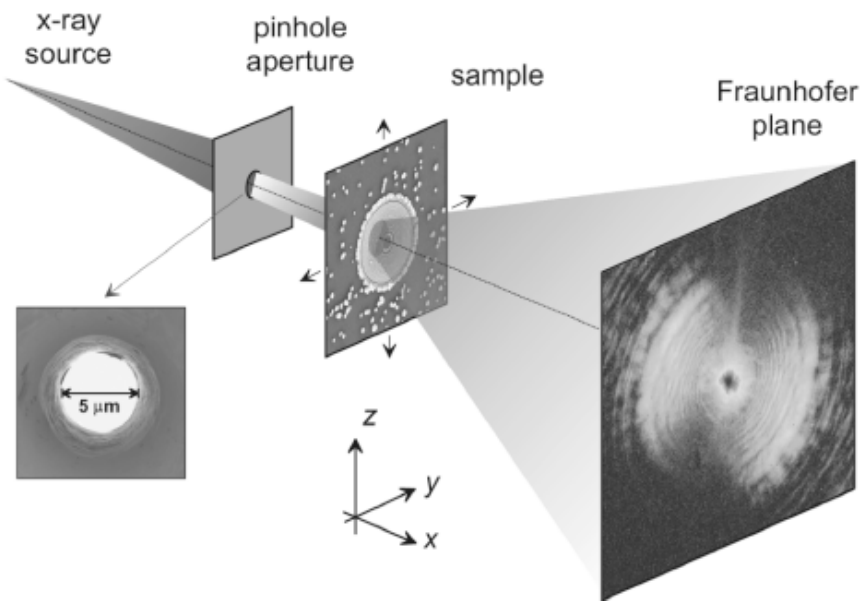
納入先 Center for Advanced Laser Application (CALA) で、the Ludwig Maximilians University of Munich (LMU) と the Technical University Munich (TUM) との joint project (WEB information)

単色光を用いた phase contrast imaging (初期段階の小さな乳がんの発見)。将来、治療にも？

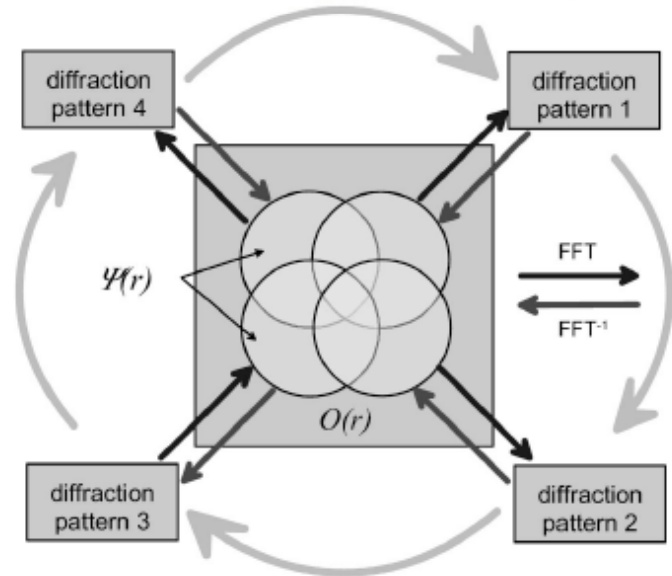
Coherent X-ray diffraction imaging



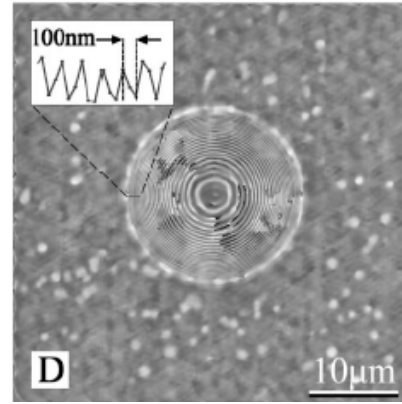
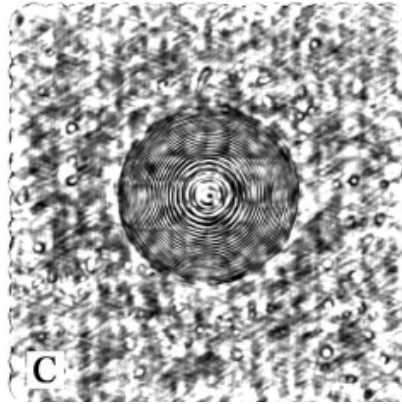
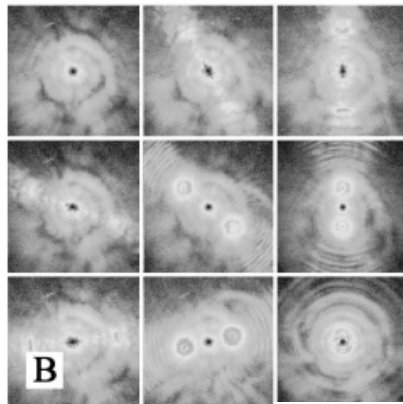
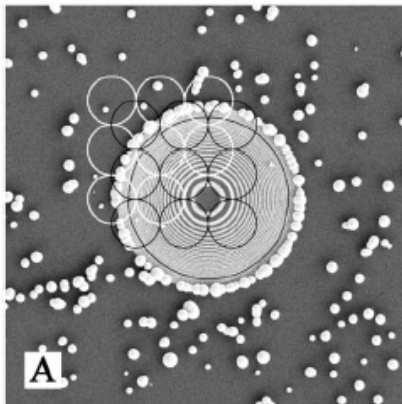
Ptychography



Phase retrieval inversion algorithm



別名：lens-less microscope



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