GLOBUS WORLD

Argonne NATIONAL LABORATORY

GLOBUS AND X-RAY IMAGING AT THE ADVANCED PHOTON SOURCE: FROM DATA INTENSIVE TO DATA DRIVEN SCIENCE

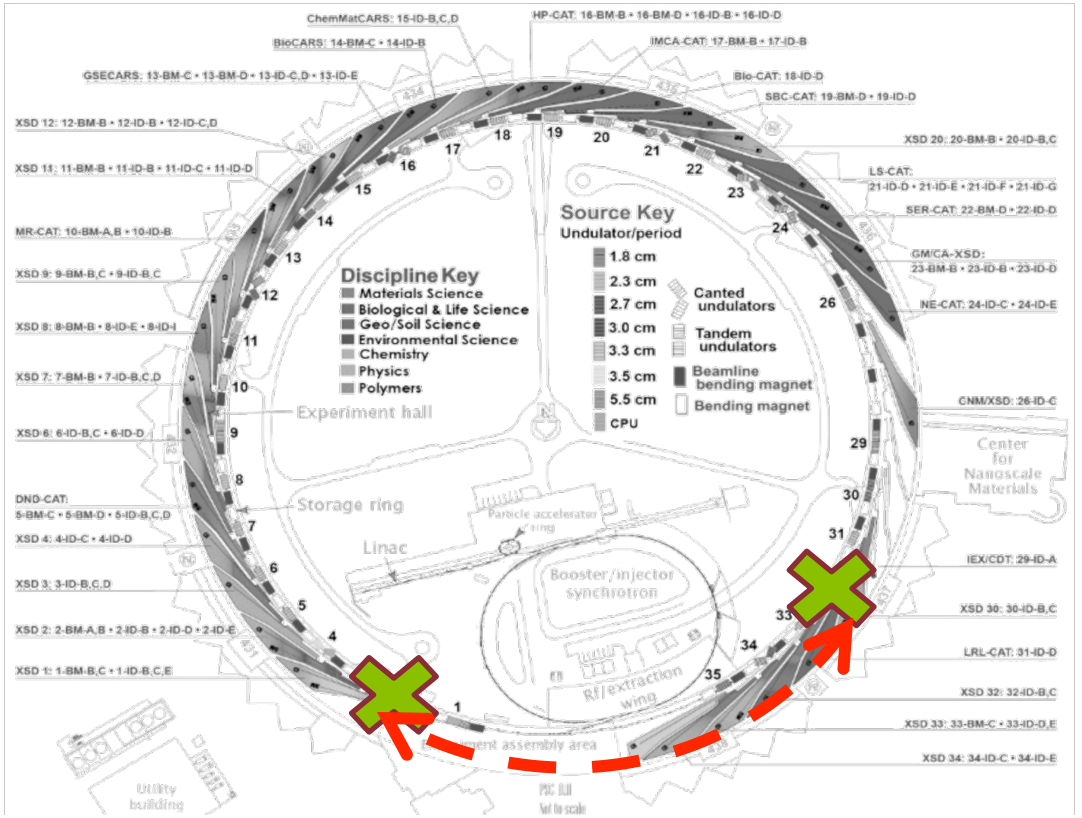
FRANCESCO DE CARLO
X-ray Imaging Group Leader
Advanced Photon Source
APS/IMG

April 21, 2016

X-RAY IMAGING GROUP

From X-ray to big data

- Operate two X-ray beamlines



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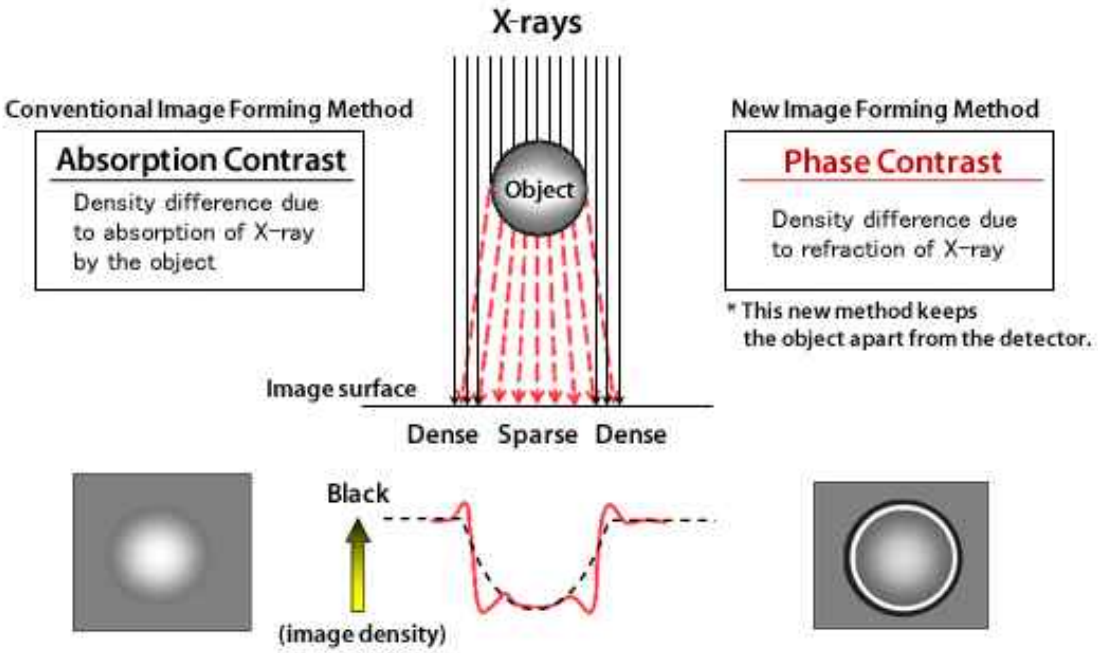
X-RAY IMAGING GROUP

From X-ray to big data

- Operate two X-ray beamlines
- Full Field X-ray Imaging



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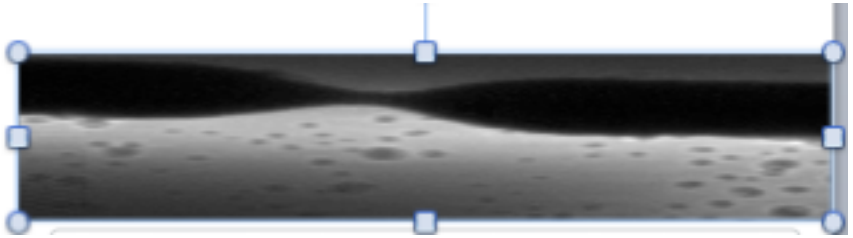
X-RAY IMAGING GROUP

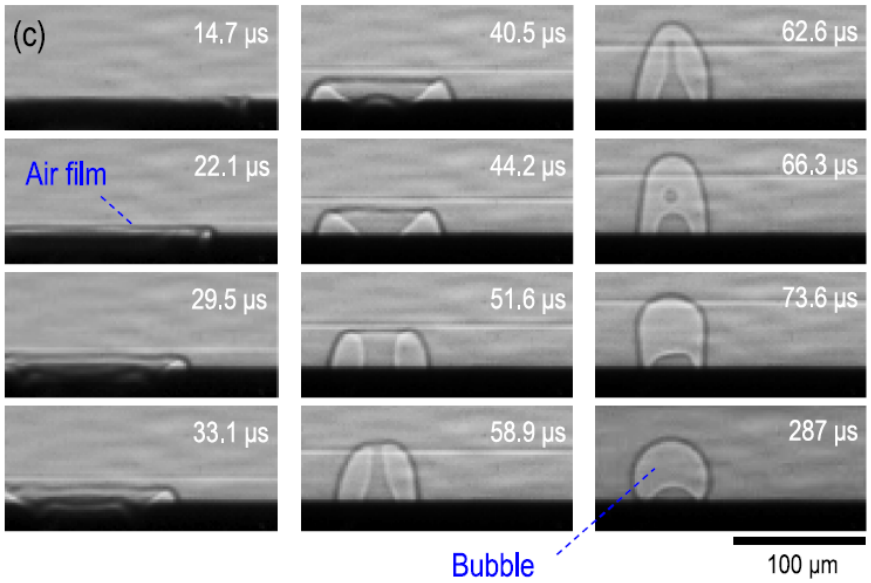
Kamel Fezzaa, APS/IMG

From X-ray to big data

- Operate two X-ray beamlines
- Full Field X-ray Imaging
- 2D High Speed Imaging



Platinum wire coated with nano-thermite powder



J. Lee, et al, Phys. Rev. Lett. 109, 204501 (2012)

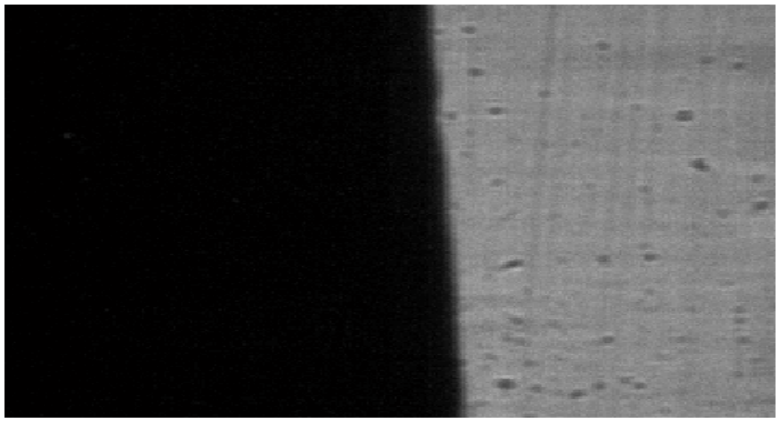
X-RAY IMAGING GROUP

From X-ray to big data

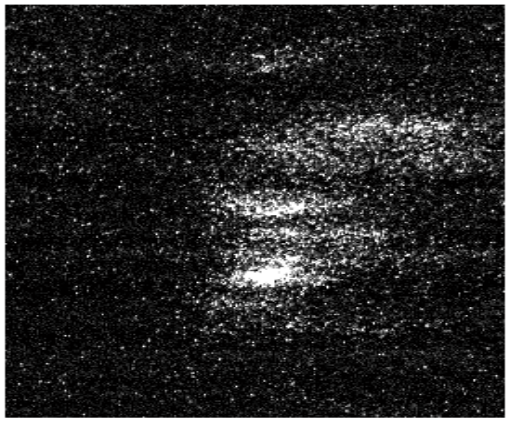
- Operate two X-ray beamlines
- Full Field X-ray Imaging
- 2D High Speed Imaging
  - Diffraction

Tao Sun, APS/IMG

Dynamic loading



- Sample Al: 40 kHz, 5 μs
- Stress-strain, grain refinement



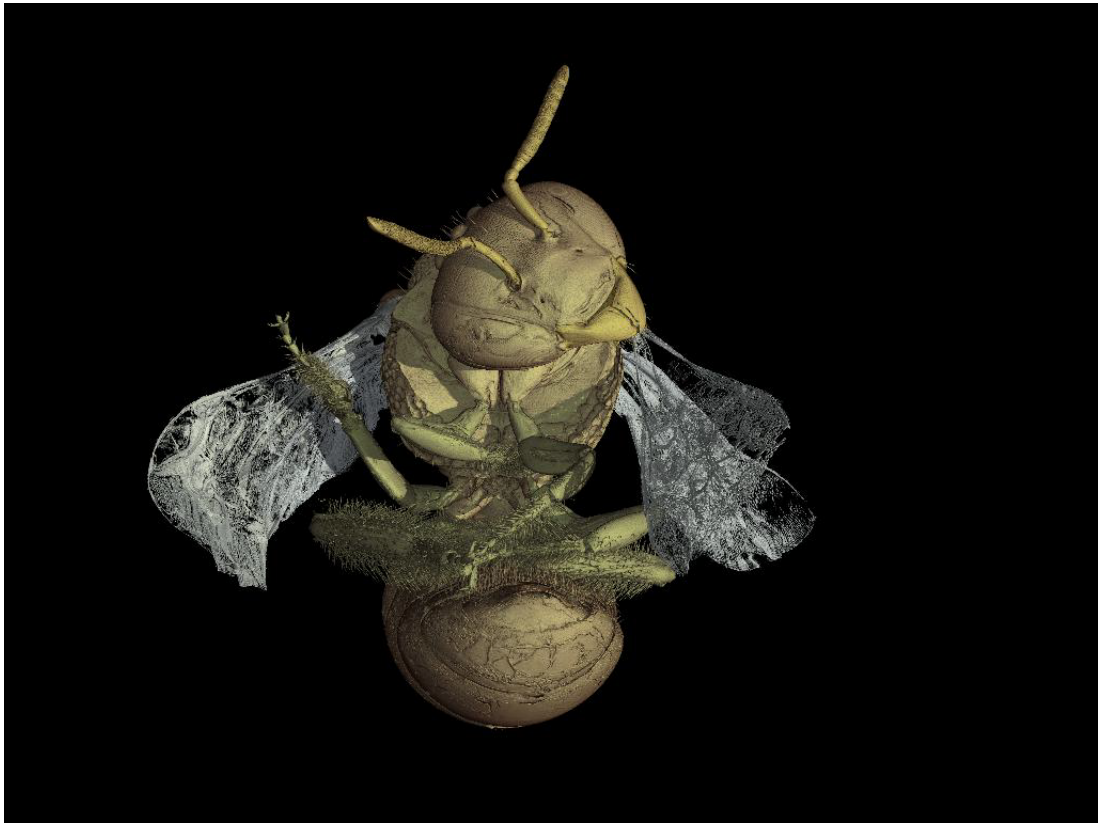
X-RAY IMAGING GROUP

Carmen Soriano, APS/IMG

From X-ray to big data

- Operate two X-ray beamlines
- Full Field X-ray Imaging
- 2D High Speed Imaging
  - Diffraction
- 3D Imaging

Social bees in amber (30 myo)



Engel & Soriano, submitted

X-RAY IMAGING GROUP

From X-ray to big data

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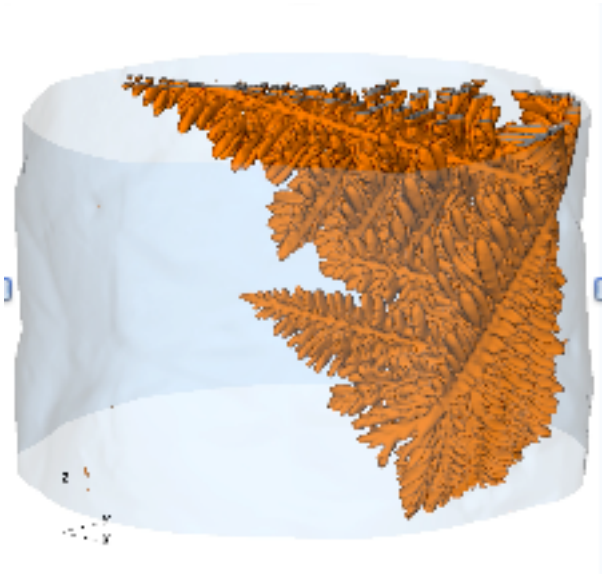
  - Diffraction
- 3D Imaging
- 3D Dynamic Imaging

Xianghui Xiao, APS/IMG

Growth of Al-rich dendrite in Al-Cu alloy
Cooling rate 1K/min from 550 K
3D tomographic dataset in 1.6 s



Sci. Rep. **5**, 11824-1-11824-9 (2015).

X-RAY IMAGING GROUP

From X-ray to big data

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  - Diffraction
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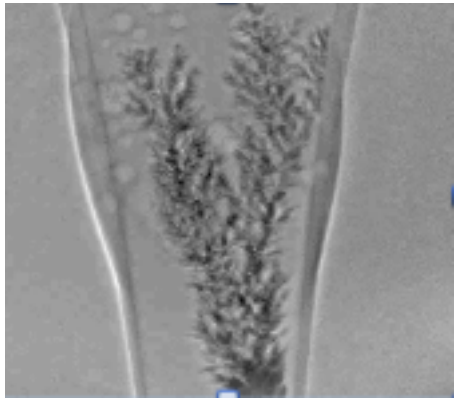
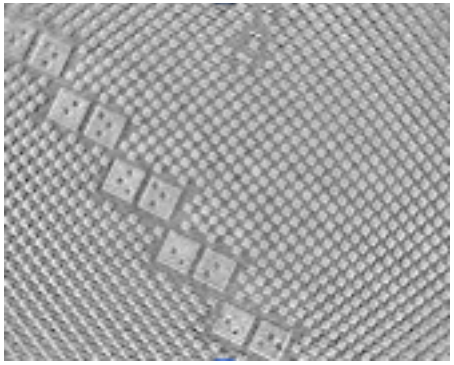
- 3D Dynamic Imaging
- 3D nano Imaging

Vincent De Andrade, APS/IMG

Fractal growth of metal in non-equilibrium electrodeposition





Electronic chips

X-RAY IMAGING GROUP

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- 3D Imaging
- 3D Dynamic Imaging
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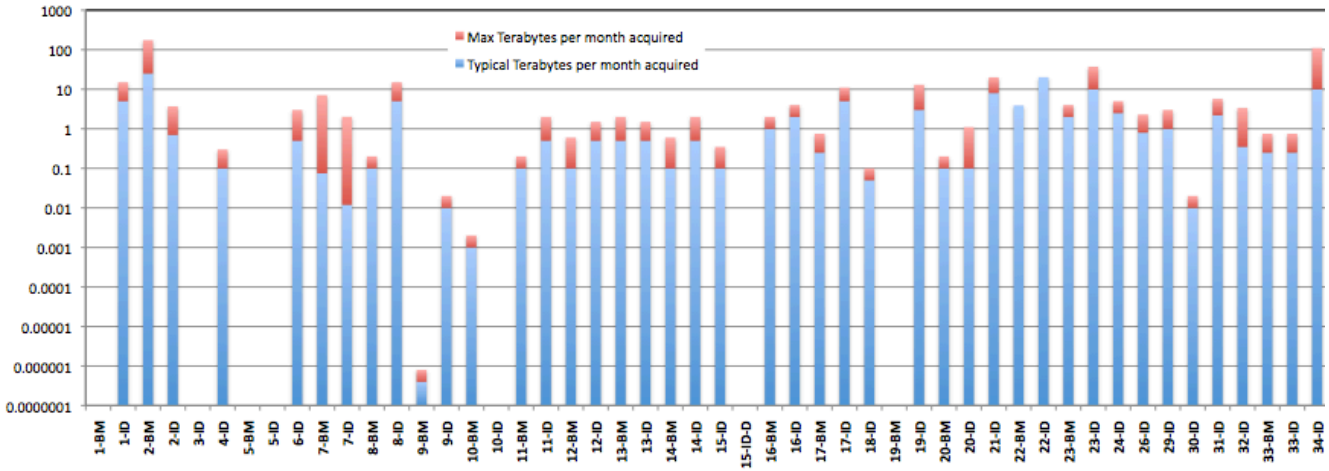
- Big Data

Cumulative typical data volume at present: 112 TB/month
Cumulative maximum data volume: 368 TB/month



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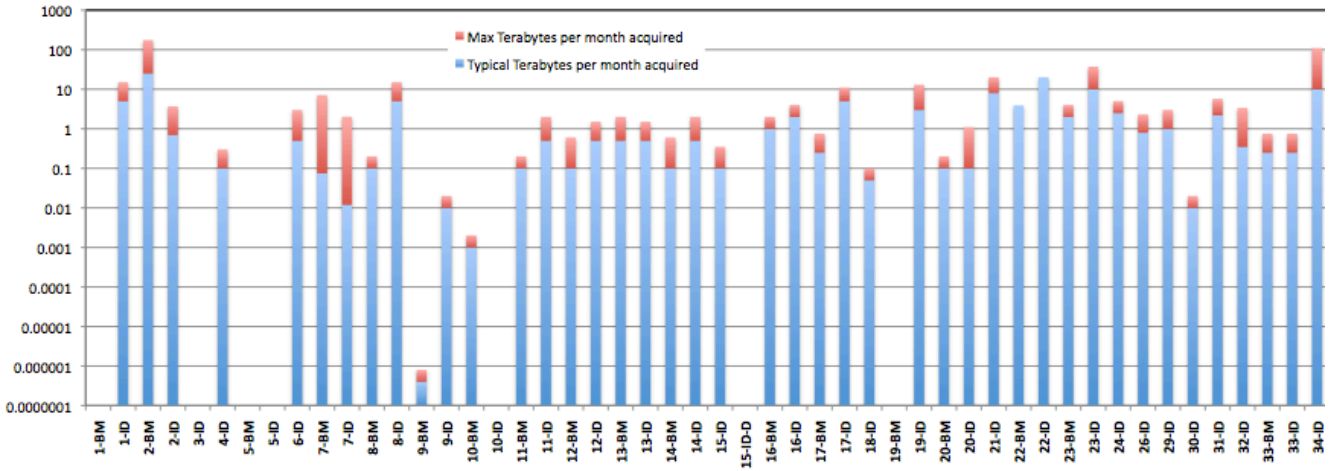

Fast detector +
3D stitching

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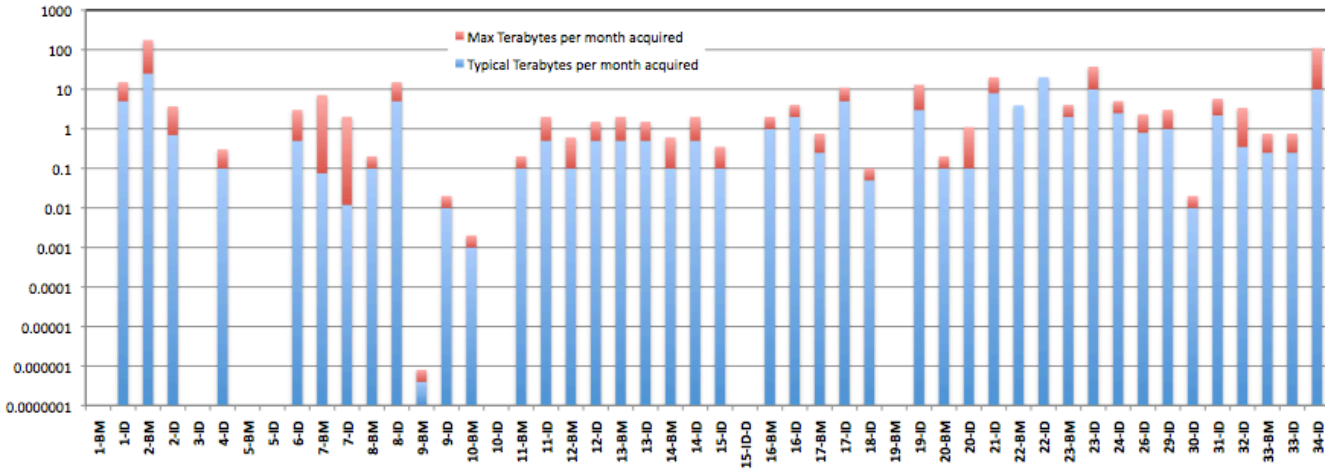


Today: first 20k x 20k images
>200TB per data set!

GLOBUS IMPLEMENTATION

X-RAY IMAGING GROUP

From X-ray to big data

globus

http://globus.org

DMagic a Globus implementation at the APS

http://dmagic.readthedocs.org

TomoPy

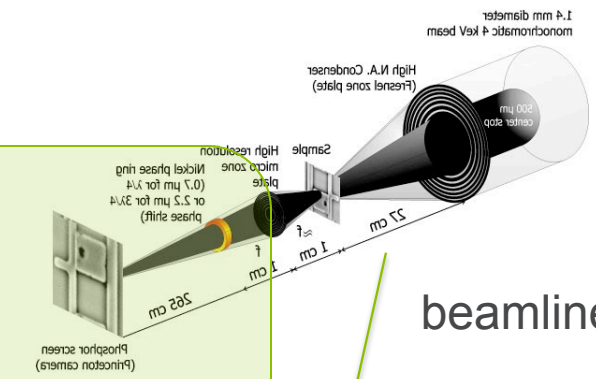
Tomographic reconstruction in Python

Doga Gursoy

http://tompy.readthedocs.org

DMAGIC

a Globus implementation at the APS



beamline

Detector

Data Analysis

beamline scheduling

Raw data
Meta data

Today's date

2 Globus tracks shared files – no need to move files to cloud storage

1 A user selects file(s) to share and sets access permissions for individuals or groups

3 User B logs in to Globus to access shared file(s)

A

B

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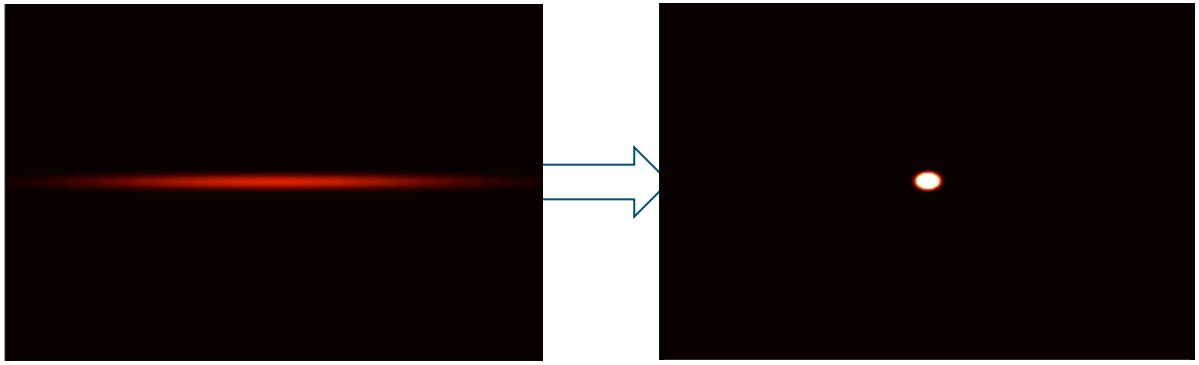
FUTURE

APS-U



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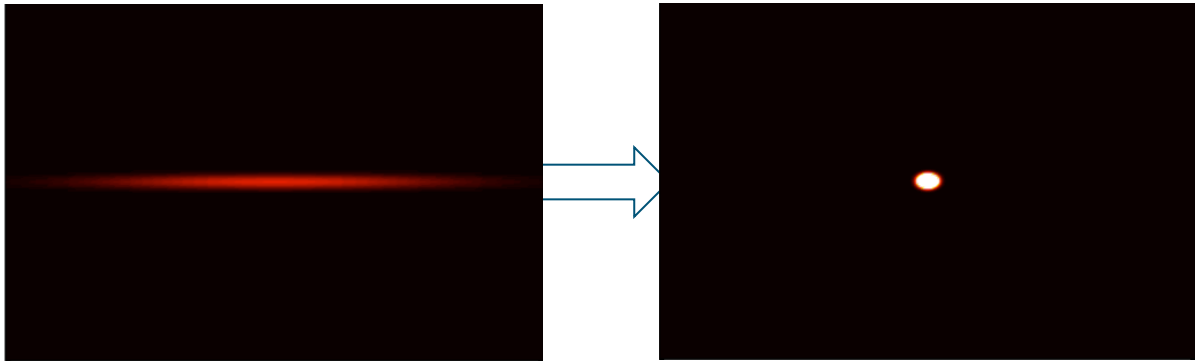

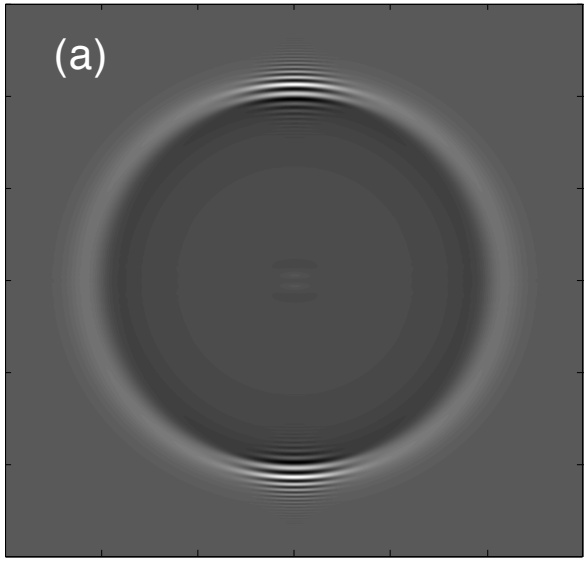

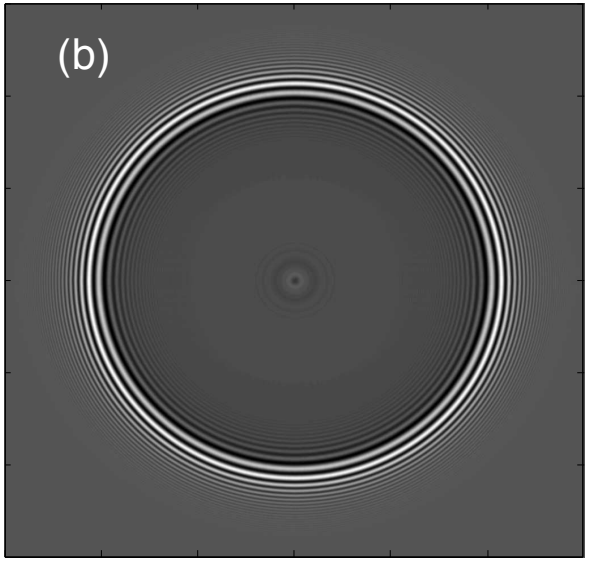

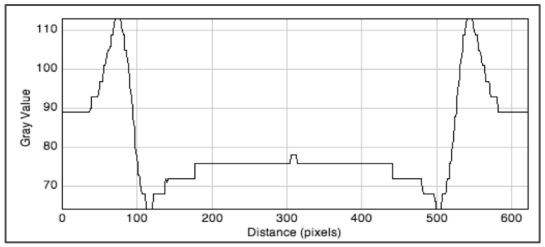

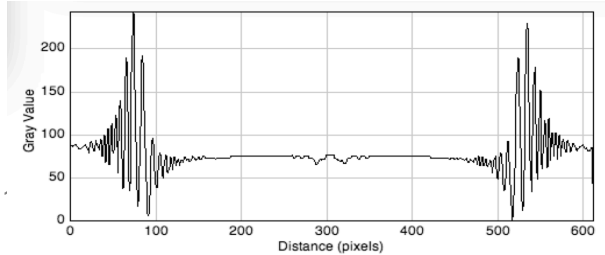

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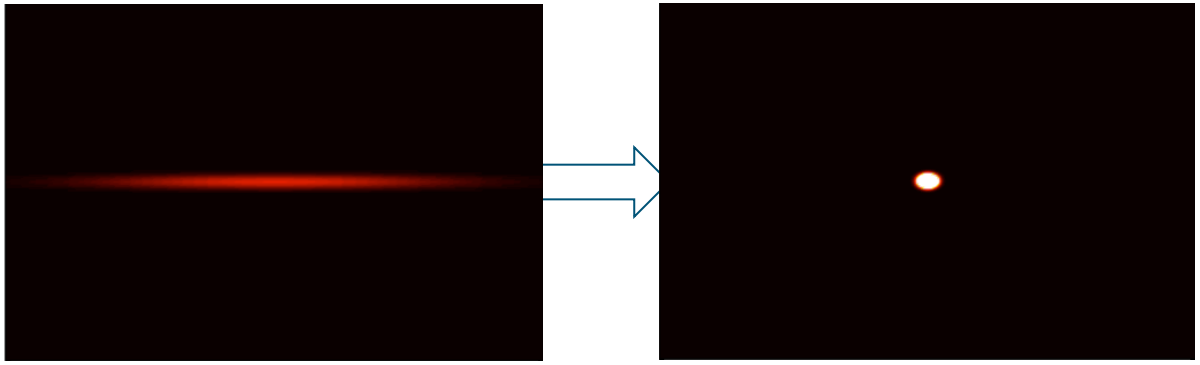

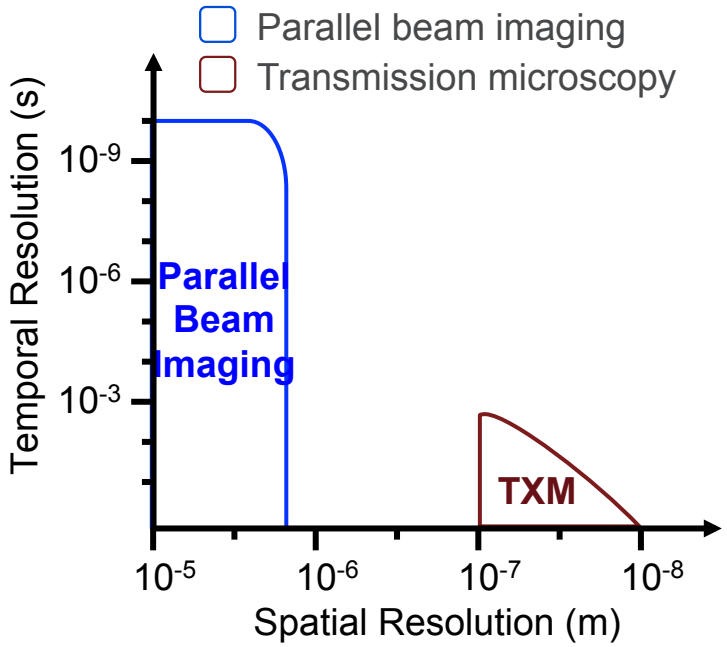

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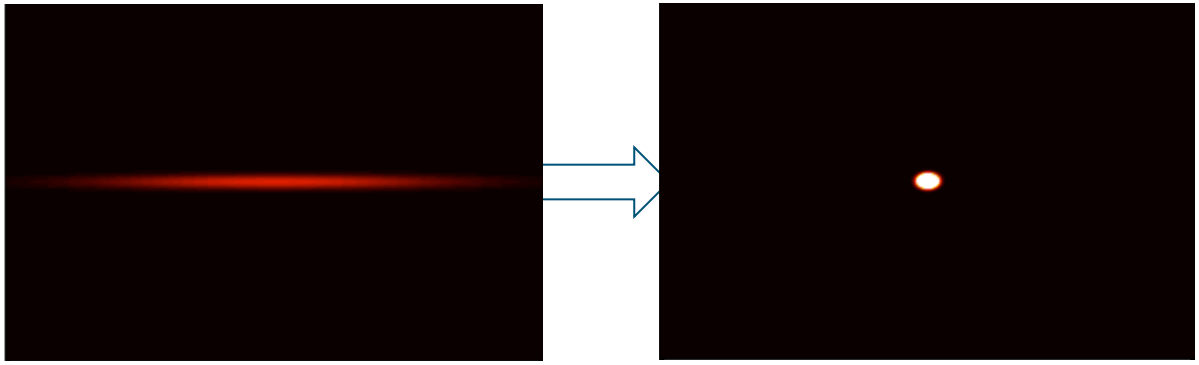

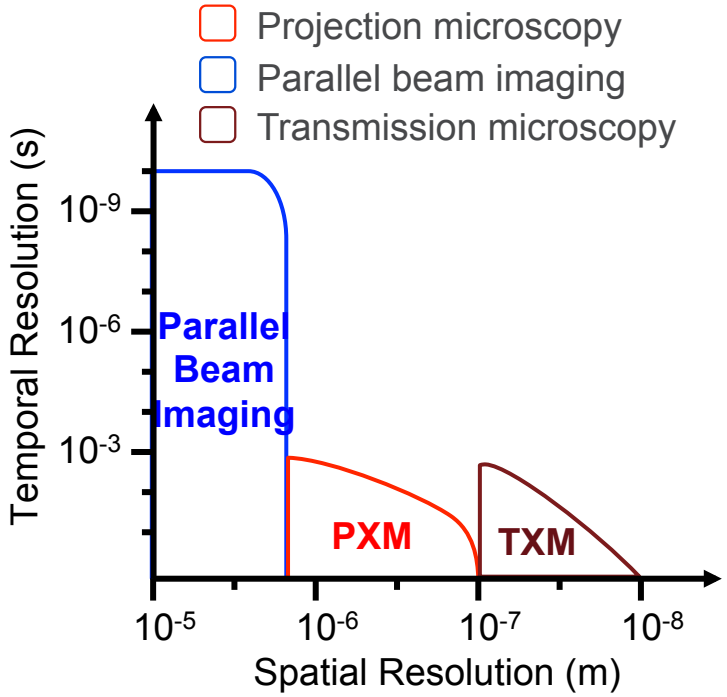

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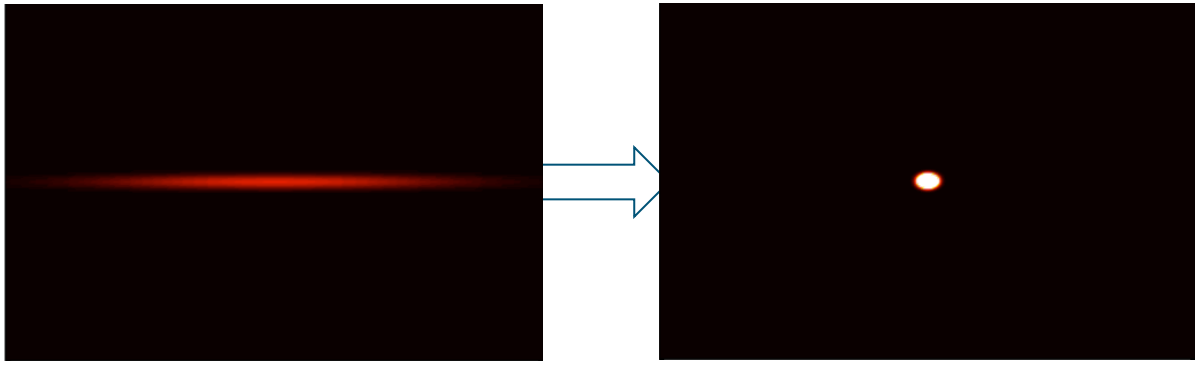

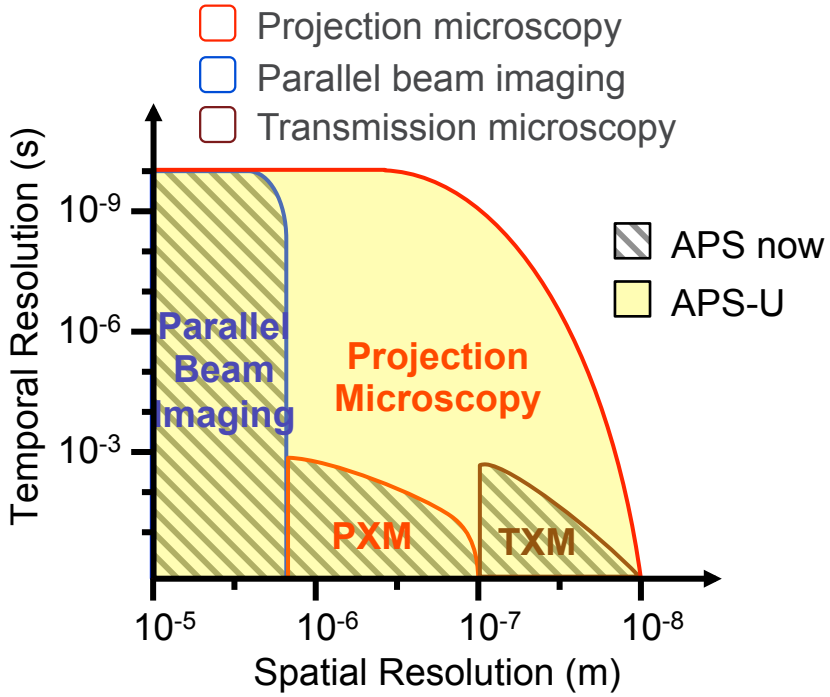

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THANKS