

Industrial Research Program

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Facility Director's 5-way Meeting

February 24, 2020

Outline

- Workshop for industrial researchers, May 28, BNL
- Industrial research program at NSLS-II
- Industrial program at DLS, ESRF, CLS
- Some closing thoughts on industry program

BNL User Facilities Workshop for Industrial Researchers: May 28th 2020



- Objective is to highlight capabilities at NSLS-II and CFN to address industrial problems and to attract potential new users from industry
- Plan to start this workshop as a part of annual series, rotating at different Labs
- This workshop will focus on NSLS-II and CFN at BNL, with posters from the other SUFD facilities
- Agenda finalized, invitations sent. Will include talks, discussions and a *'Bring-your-sample' Test Bench* to try out experiments at select NSLS-II beamlines and CFN instruments
- Program committee: Black, Hill, Upadhyaya, Wang (BNL), Abney (Exxon), Dimarzio (Northrop Grumman), Gao (GE), Lavelly (BAE), More (ORNL), Petrash (Henkel)



Workshop for INDUSTRIAL RESEARCHERS

Come and see how to advance your research with Brookhaven's world-leading facilities

May 28, 2020

Brookhaven National Laboratory

Do you have an R&D challenge that you can't solve with traditional commercial techniques?

We, at Brookhaven Lab, have the expertise to address your R&D questions with unique capabilities offering exquisite sensitivity and resolution.

In this specialized workshop, we offer access to unique x-ray, electron and optical techniques, which are designed for understanding materials in unprecedented ways.

Let's work together to solve your R&D challenges!

www.bnl.gov/industryworkshop2020

Agenda

May 27

6:00 pm -8:00 pm Reception with facility posters session

May 28

8:00am Breakfast

8:30am Welcome/Charge of the workshop,
Chuck Black

8:55am Industry talk by ExxonMobil, Pedro Serna

9:25am Industry talk by BASF, Ke-Bin Low

9:45am Industry talk by Edgehog, Calvin Cheng

10:00am Overview of capabilities of NSLS-II and CFN
John Hill

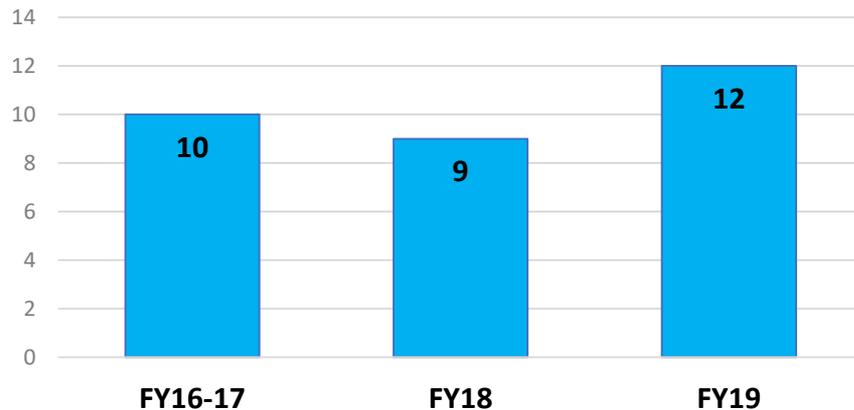
10:30am coffee break

Session 1	Session 2 10:50-5:00 OPEN HOUSE
10:50 Discovery Park – Martin Fallier 11:10 SBIR/STTR – Claudia Cantoni 11:30 Perceived challenges to be a user and how to get around them— LM/PA 11:35 Panel discussion—lesson learned as industrial user at facilities Facilitators: program committee members	Open House, with experimental stations available for viewing in operation
12:10 Lunch and capability posters	12:10 Lunch
1:30-5:00 Table discussions Table 1 Capability posters and technical questions for facility scientists. Ignace, Jurgen. Table 2 Help Desk for questions including how to become an industrial user and types of access mode (JW, KN), how to write a good proposal (LM,PA), contract issues and TCF & license (EH, EM, Poorni, Price). Table 3 DOE SBIR/STTR Program (Claudia Cantoni) Table 4 DOE TIR Program (Eli Levine) Table 5 Other facilities Table 6 Venture capitalist (Ram Akella)	1:30 Open House (cont')
5:00-5:15 Wrap up by John/Chuck	

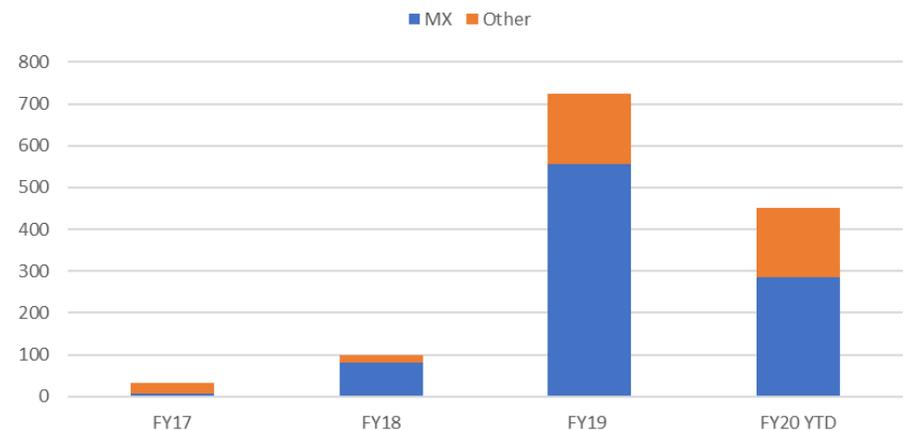
Industrial Proprietary Research at NSLS-II

- 31 companies have signed proprietary user agreements so far with NSLS-II, including GE, DuPont, Duracell, BASF, Pfizer, BMS. Working with another 4 companies to sign PUA
- 725 hours total beam time run in FY19
- 452 hours total beam time run in FY20 YTD
- Total cost recovered (FY19)= \$307,357
- Showing significant growth.

Number of companies signed PUA

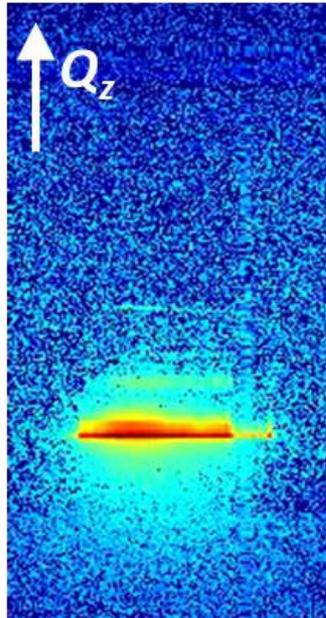
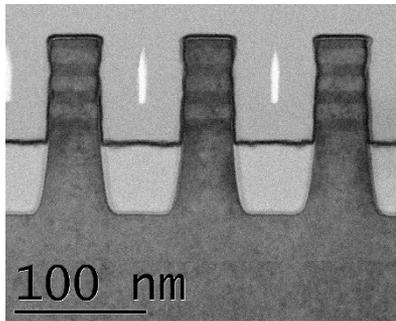
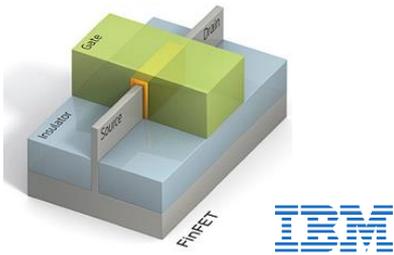


Hours Run



IBM Develops Future Microelectronics Architecture

FinFET



Nano-diffraction image (right) from nanosheet gate structure (left) using a 10 nm x-ray beam at NSLS-II HXN beamline

C. Lavoie, C. Murray, J. Jordan-Sweet, N. Loubet (IBM);
H. Yan, X. Huang, Y. Chu (NSLS-II)
Preliminary results; unpublished work

Work was performed in part at Brookhaven National Laboratory

Scientific Achievement

IBM uses nano-diffraction at NSLS-II to understand strain distributions in a newly-developed nanosheet-based gate-all-around (GAA) architecture, which is a promising next-generation 5 nm node technology.

Significance and Impact

As the microelectronics industry scales to smaller dimensions and adopts complex 3D morphologies, strain in these structures determines their future performance; hence the need for a characterization tool to advance beyond state-of-the-art 7 nm technology.

Research Details

- 3D rocking curve measurement at NSLS-II's HXN beamline provided strain mapping vs lateral dimensions on a single nanosheet (that can be as thin as 7 nm, by 100 nm tall)
- Ongoing development will enable 5 nm sensitivity.



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Summary on Strengthening Industry Engagement

Provide flexible, fast, easy access

- Improve proposal review
- Increase capacity
- Improve processing of paper work

Enhance scientific support

- Matrixed scientist
- Postdoc/SA
- Financial support partially from proprietary revenue

Provide industry-relevant environment

- High throughput
- Industrial friendly working environment
- Data protection

Enhance engagement

- Visibility of industry program
- Leadership level, working scientist level
- Training, tracking database
- Visiting, hosting
- Joint funding

**BES teleconference on
June 14, 2019**

Some Closing Thoughts on Industry

- Workshop series – a good way to highlight and promote industry research at LS facilities
 - Other approaches, e.g. industry highlights to DOE?
- Work together to expand industry research at our facilities
 - Promote and reward staff for spending their time on industry research
 - Coordinate access to better accommodate industry R&D interest
- Industry involvement – key component in recent DOE initiatives,
 - e.g. microelectronics, transformative manufacturing, quantum
 - Important in current funding climate
- NSLS-II very interested in working with other facilities in these areas