HIGHLY AUTOMATED MACROMOLECULAR CRYSTALLOGRAPHY (AMX)

BROOKHAVEN NATIONAL LABORATORY

NATIONAL SYNCHROTRON LIGHT SOURCE II

SCIENTIFIC SCOPE

The highly automated macromolecular crystallography beamline (AMX) is an undulator beamline in sector 17-ID providing with its high flux, small focal spot, expandable beam size, and tunable energy best-in-class capabilities for structure determinations of all biomedically important macromolecules and their complexes. With its state of the art pixel-array detector and specimen handling automation for cryogenic and room-temperature data collections it is a driver of the full development of the emerging serial crystallography methods at synchrotrons. AMX construction under the ABBIX project was funded by the NIH. Operation of the ABBIX beamlines is supported by the NIH and DOE BER through the Life Science and Biomedical Technology Research Center (LSBR) grant.

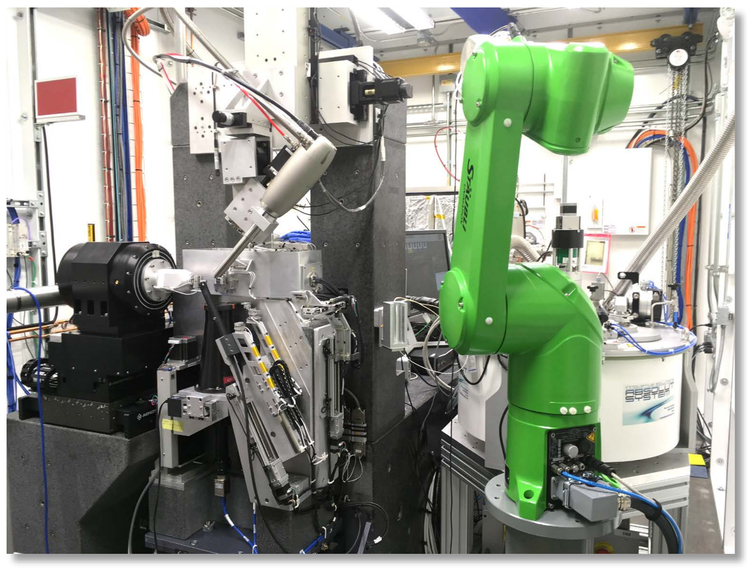
BEAMLINE CHARACTERISTICS

TECHNIQUE:

- Macromolecular Crystallography

EXPERIMENTAL STATION DETAILS:

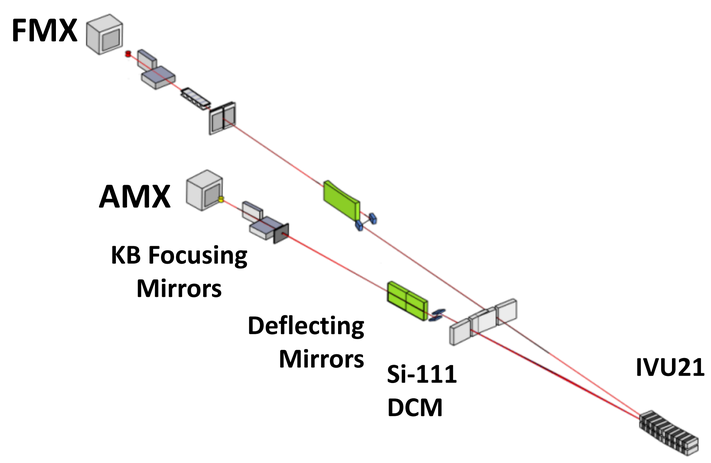
- Advanced pixel-array detector
- Multi-axis goniometry
- High capacity sample Dewar
- Six-axis sample changing robot



AMX experimental station

AMX at NSLS-II:

- Enables structure determination of macromolecular assemblies in large unit cells and from small crystals
- Efficiently finds best diffracting volume in crystals and tiny crystals in opaque media
- Provides high quality data from fast automated data collections



Optical layout of AMX and FMX

Overview

PORT: 17-ID-1 for AMX (17-ID-2 for FMX)

SOURCE: Canted IVU21 Undulator

ENERGY RANGE: 5 – 18 keV

ENERGY RESOLUTION: $\Delta E/E = 1.6\times10^{-4}$

FLUX: 8×10^{12} ph/s

NATIVE FOCAL SPOT: 4 µm (h) × 3 µm (v)

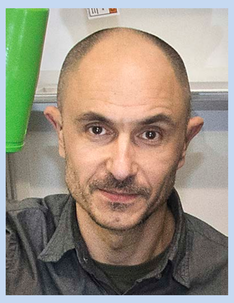
SPATIAL RESOLUTION: 1 – 1000 Å

BEAMLINE STATUS: Open to users

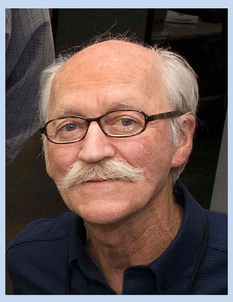
BEAMLINE PHONE: 631-344-1617

BEAMLINE WEBSITE:
www.bnl.gov/nsls2/beamline/17-ID-1

Beamline Staff



Jean Jakoncic
Beamline Scientist



Dieter Schneider
Lead Beamline Scientist

Alexei Soares
Beamline Scientist

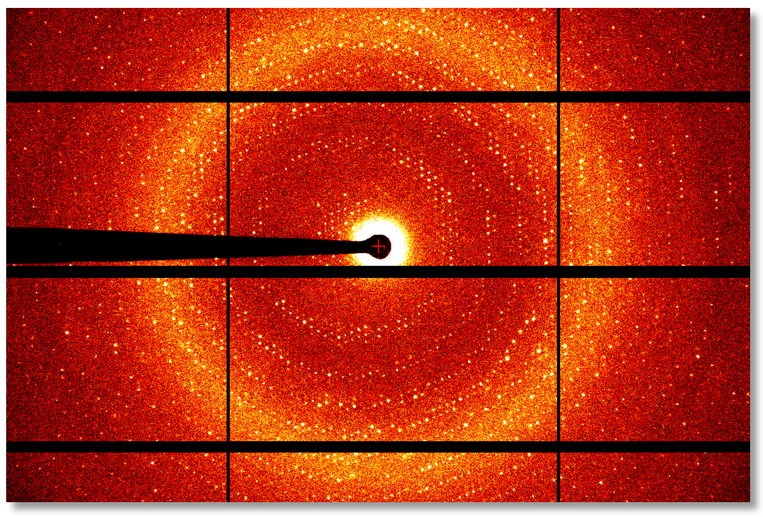
Apply for Beam Time

Beamlines at NSLS-II are available to all scientific researchers through a peer-review proposal process. For more information, see the NSLS-II Users' Guide at:

www.bnl.gov/ps/userguide/

SCIENTIFIC APPLICATIONS

- Collection of highly redundant x-ray diffraction data sets using the serial crystallography method adapted to synchrotrons and their near real-time analysis.



Central portion of one diffraction image of ferritin taken with an exposure time of 5 ms (0.2° rotation).

- Determination of atomic structures of macromolecules and their assemblies in functional organelles to reveal the function of fundamental cellular and molecular processes.

Ribbon diagram of a pentameric formate channel. From Waight *et al,* Nature Structural Biology 17, 31-38 (2010).

- For structural biologists ready, repeated, and remote access to the automated AMX beamline is essential to advance investigations of membrane proteins, ribozymes, fragile, and variable crystals, from first crystallization trials through structure determinations.
- For pharmaceutical companies AMX is an efficient resource to further their development of new drugs, antibiotics, and vaccines.