MXCuBE at LNLS/Sirius

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Presentation at:

bit.ly/sirius-mx3-2019

Summary

- **LNLS**
  UVX and Sirius
  MX2 and MANACÁ
- **MXCuBE**
  Background
  Status
- **Future work**

CNPEM

National Center for Research in Energy and Materials

Campinas, São Paulo - Brazil

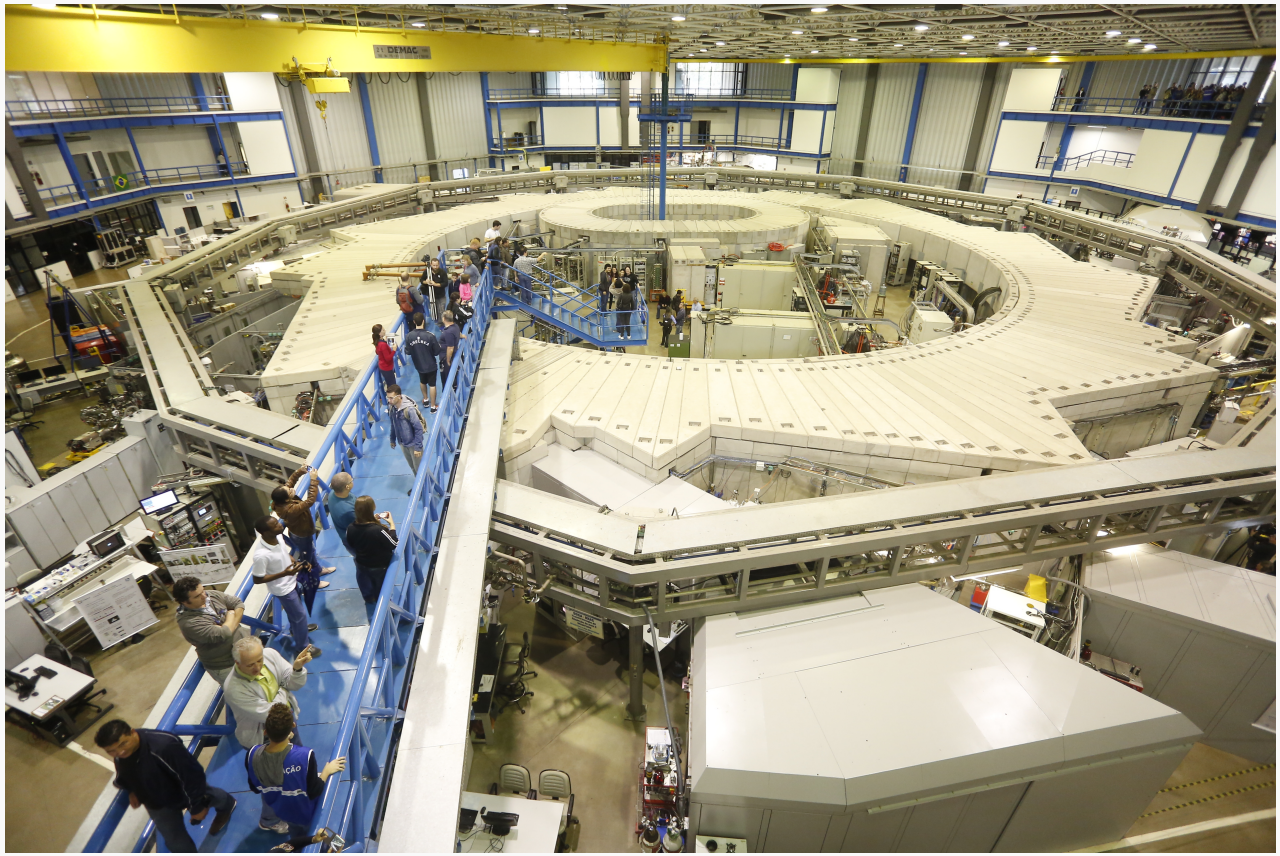
4 National Laboratories

1. LNLS (Synchrotron Light Source)
2. LNBio (Biosciences)
3. LNNano (Nanotechnology)
4. LNBR (Biorenewables)

http://cnpem.br/

LNLS

- Since **1997**, Latin America's only synchrotron light source

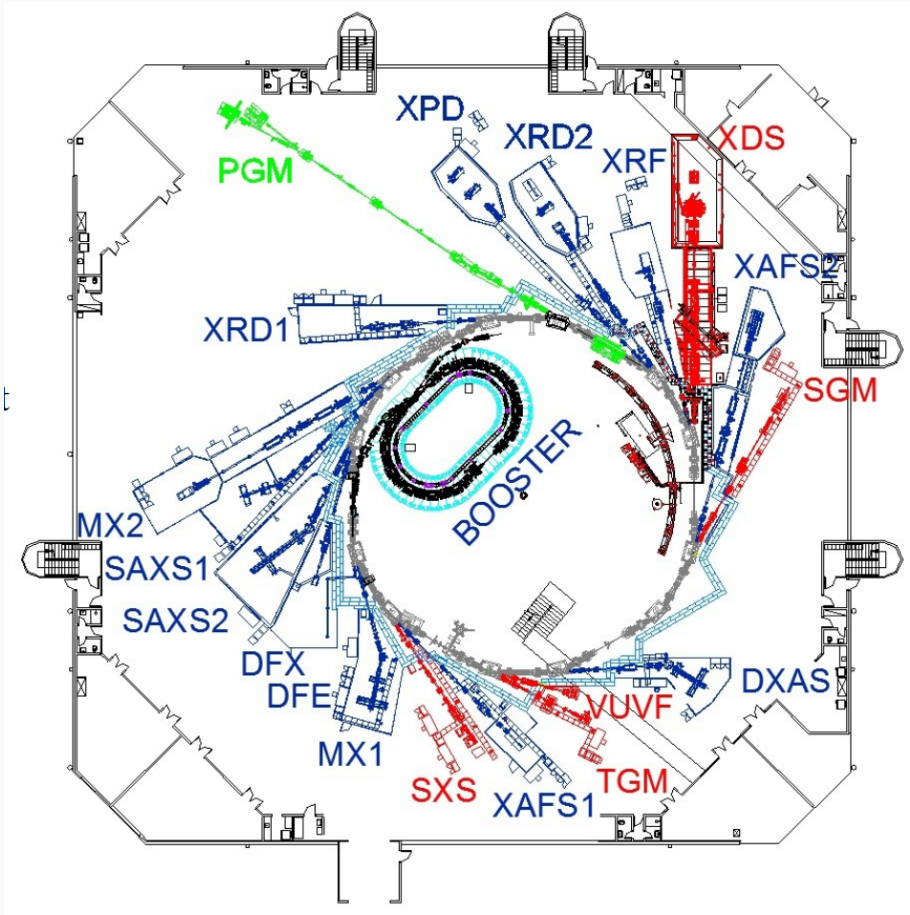


UVX synchrotron

Electron Energy:	1.37 GeV
Current:	250 mA
Circumference:	93 m
Diameter:	29.7 m
Straight sections:	6
Beamlines:	18

http://www.lnls.cnpem.br/uvx

UVX



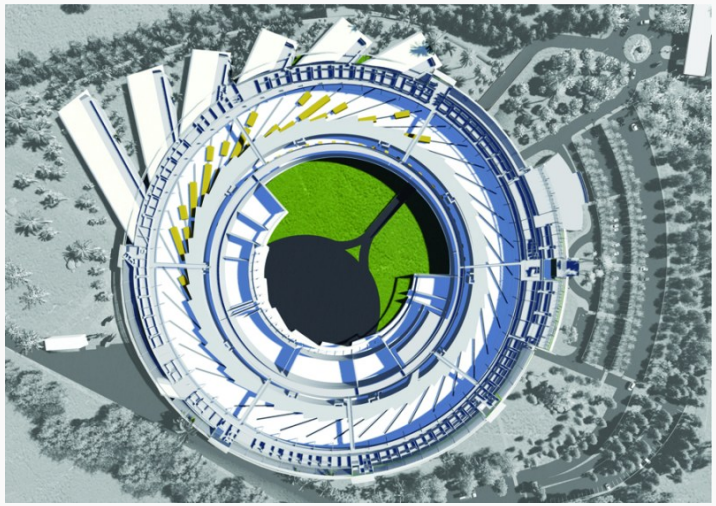
BEAMLINES

XRD1	PGM	XPD	XRD2	XRF
XDS	XAFS2	SGM	IMX	DXAS
TGM	XAFS1	SXS	IR1	SAXS2
SAXS1	MX2			

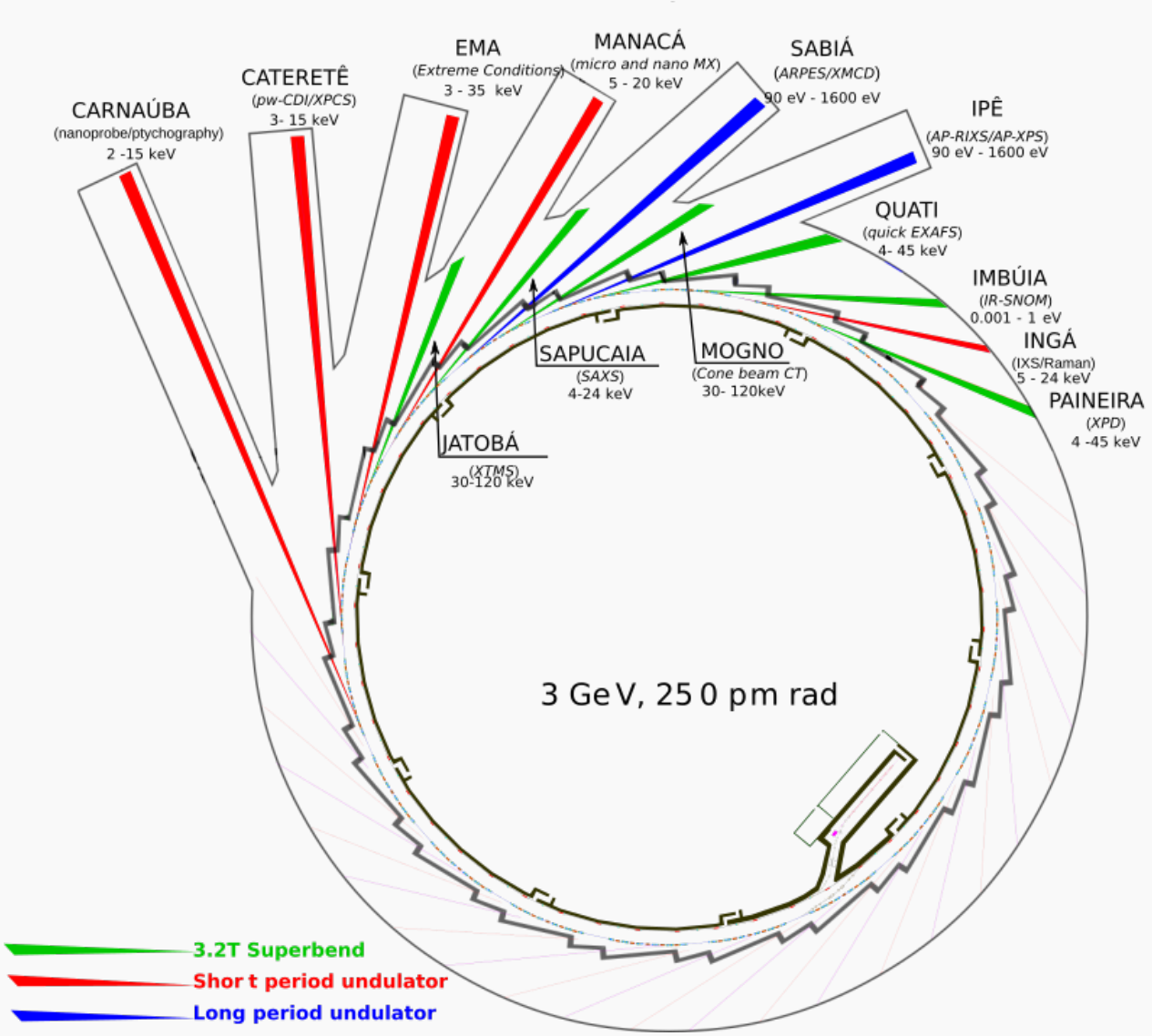
Sirius - The New Brazilian Synchrotron

Sirius on Open Science day

Energy:	3 GeV
Current:	350 mA
Circumference:	518.4 m
Diameter:	165 m
Straight sections:	20
Beamlines:	40



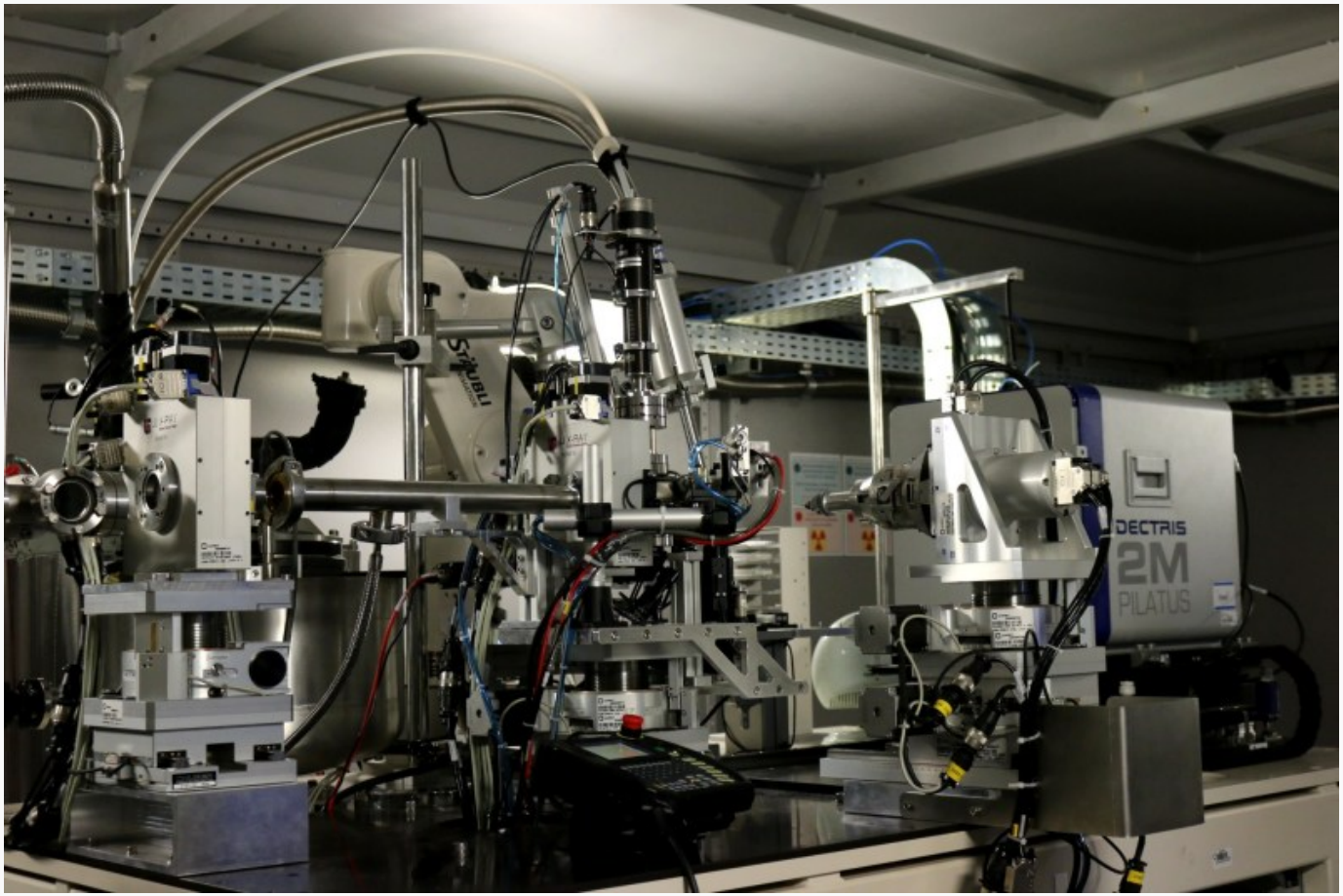
http://www.lnls.cnpem.br/sirius



Sirius Beamlines (1st phase)

Sirius beamlines are named after
Brazilian fauna and flora (e.g.: Manacá)

MX2 Beamline (UVX)

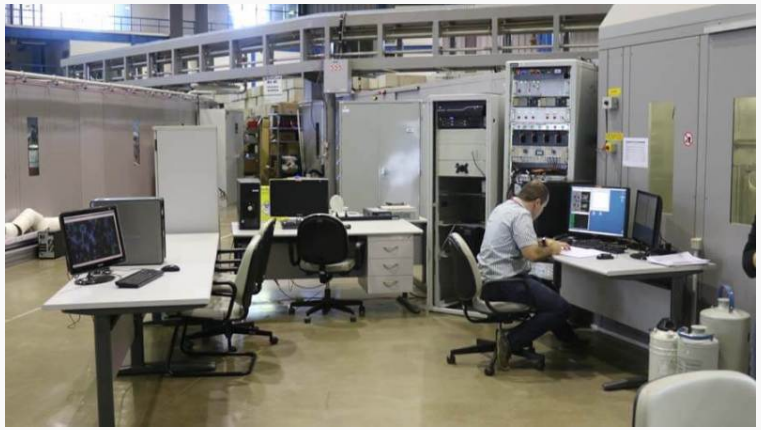


MX2 experimental station

MX2 Beamline (UVX)

Energy:	5 - 15 keV
Beam size:	150 x 500 μm
Source:	Wiggler
Area detector:	Dectris Pilatus 2M
XRF detector:	Amptek X-123SDD
Sample changer:	G-Rob
Cryostat:	Oxford Cryojet XL
Camera:	IDS UEye
Goniometer:	Huber air bearing stage + ARINAX mini-kappa (in house)

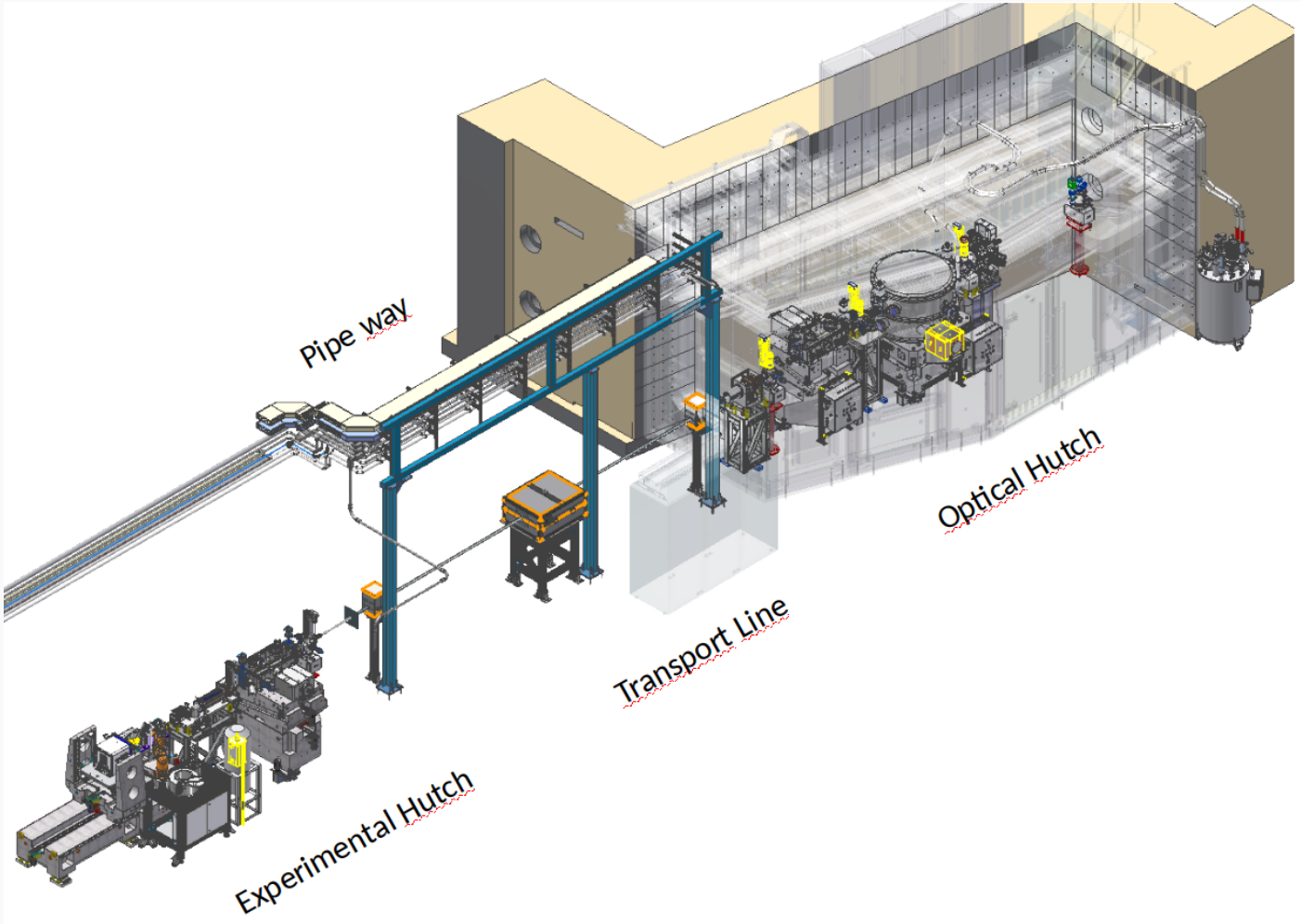
MX2 Beamline (UVX)



MX2 control station

Distributed control framework:	EPICS
Experimental GUI:	MXCuBE 2 (Qt4)
OS:	Linux (CentOS 7)
Other UIs:	CS-Studio, Py4Syn [2]

MANACÁ Beamline (Sirius)



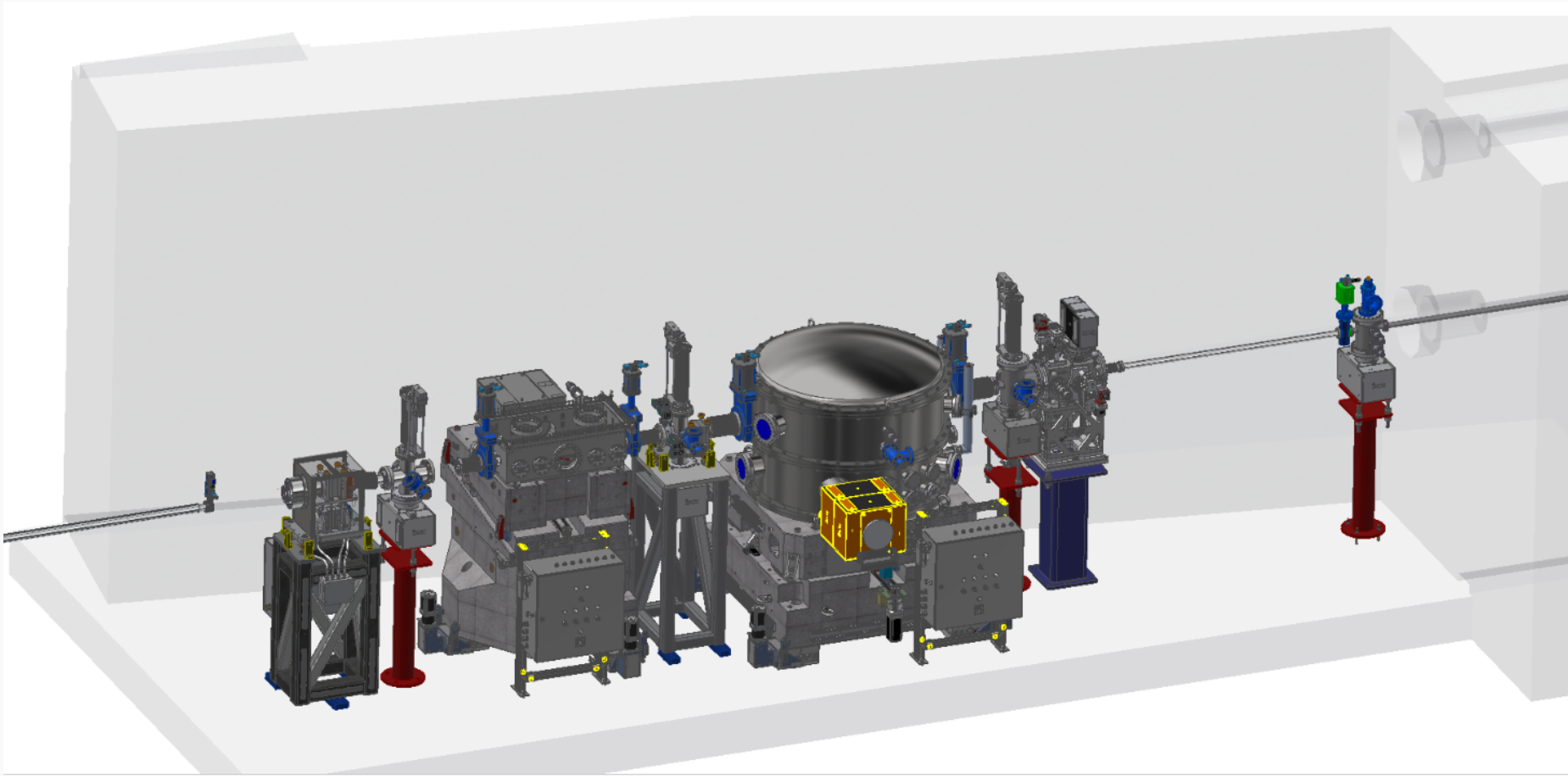
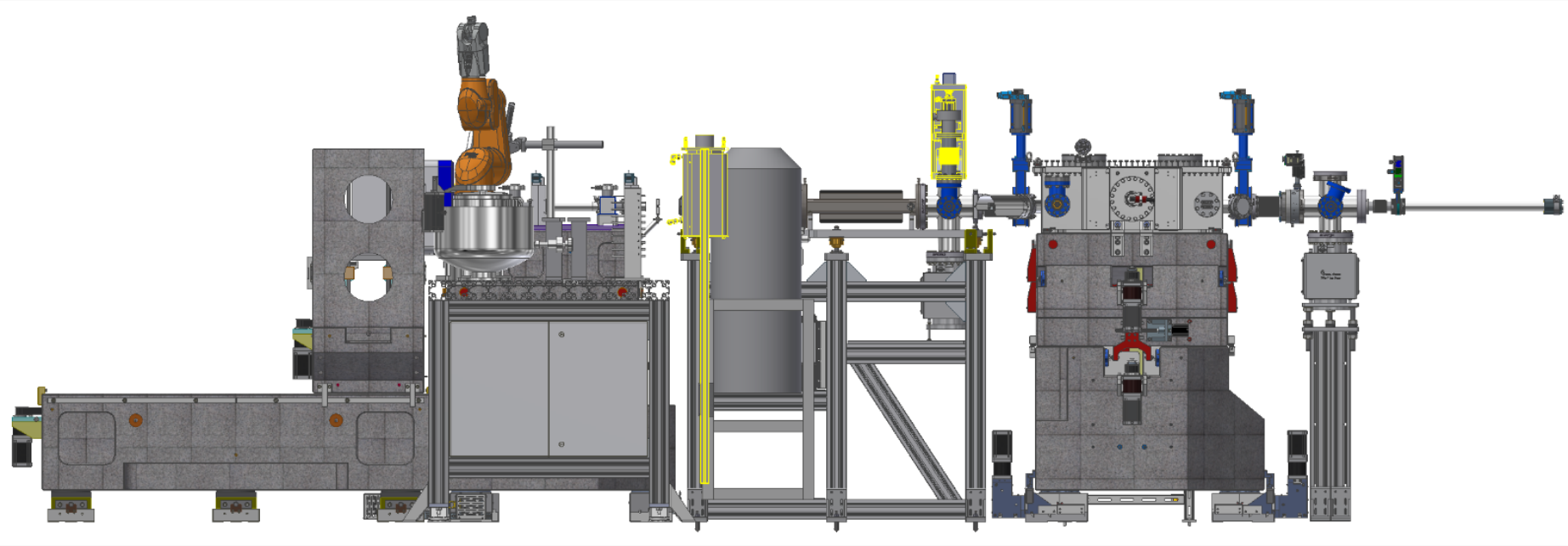


Figure: Optical Hutch



Experimental Hutch

Sirius - MANACÁ Beamline

- Micro and Nano MX (2 experimental stations)

Energy:	5 - 20 keV
Beam size:	10 x 7 μm (focused) 100-10 x 80-7 μm (adjustable) 0.5 x 0.5 μm (nano station)

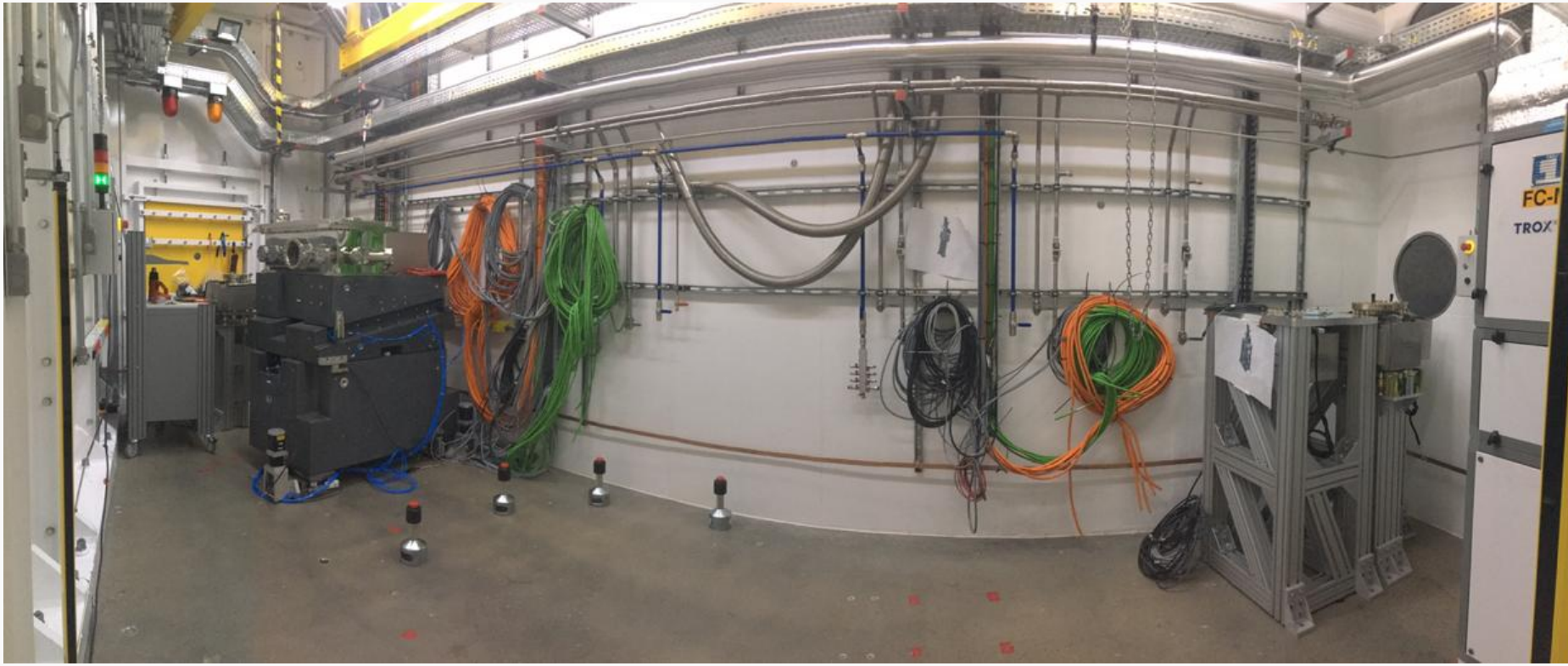
Sirius - MANACÁ Beamline

Source:	Ondulator
Area detector:	Pi-Mega (based on Medipix chip) [3]
XRF detector:	Amptek Fast SDD
Sample changer:	Stäubli TX60 (Unipuck + Plate Gripper)
Cryostat:	Oxford Cryojet
Camera:	ARINAX B-Zoom
Goniometer:	Huber air bearing stage + ARINAX mini-kappa (in house)

Sirius - MANACÁ Beamline

Distributed control framework:	EPICS
Experimental GUI:	MXCuBE 3 + HR 2.2
OS:	Debian 9
Other UIs:	PyQt, PyDM, Py4Syn

MANACÁ overview



Optical Hutch (Mirror 1 on the left)

Experimental Hutch (Table and Mirror 2)

Sirius / MANACÁ - Milestones

2019

- **Jan** – Sirius building delivered
- **Aug** – UVX Shutdown (for tests only, full focus on Sirius)

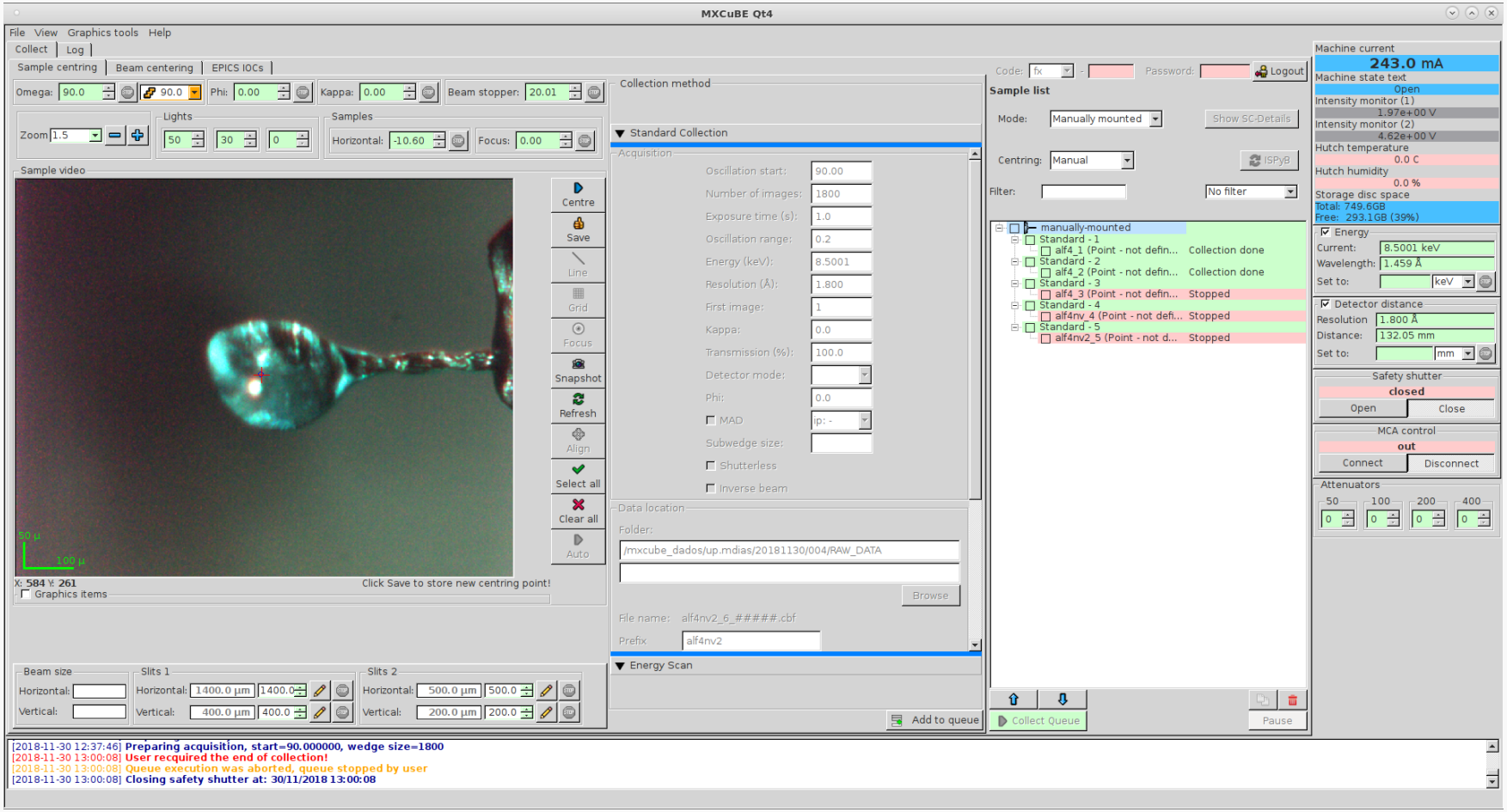
2020

- **Jan** – MANACÁ components installed
- **1st sem.** – MANACÁ in commissioning
- **2nd sem.** – MANACÁ open for users

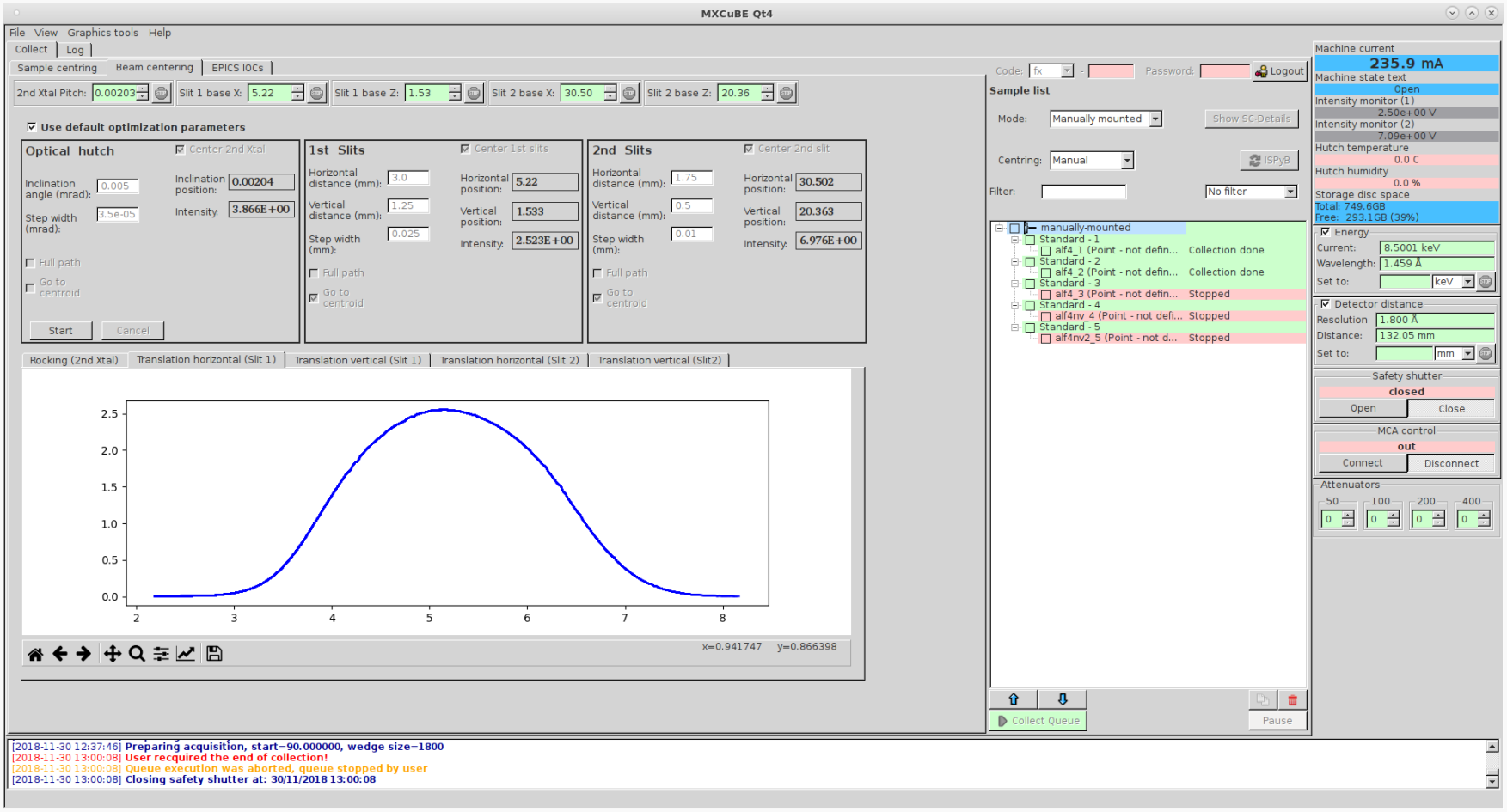
MXCuBE - Background

UVX

- 2016: **MXCuBE 2 (at MX2)**
  LNLS HOs classes dev, commissioning (Python 3.4)
- Reasons: Python, EPICS, community support
- Mid 2017: Open to the first users



MXCuBE 2 (with EPICS) at MX2



Beam Centering widget at MX2 [1]

MXCuBE - Background

Sirius

- Good feedback from users (and staff) about MXCuBE
- 2018: Online meetings, remote test with ESRF, Trieste Meeting
- **MXCuBE 3, Web (for MANACÁ)**
  Interest to adopt **ISPyB** too
- **2019:** LNLS joins MXCuBE collaboration

MXCuBE - Status

Focus on MANACÁ

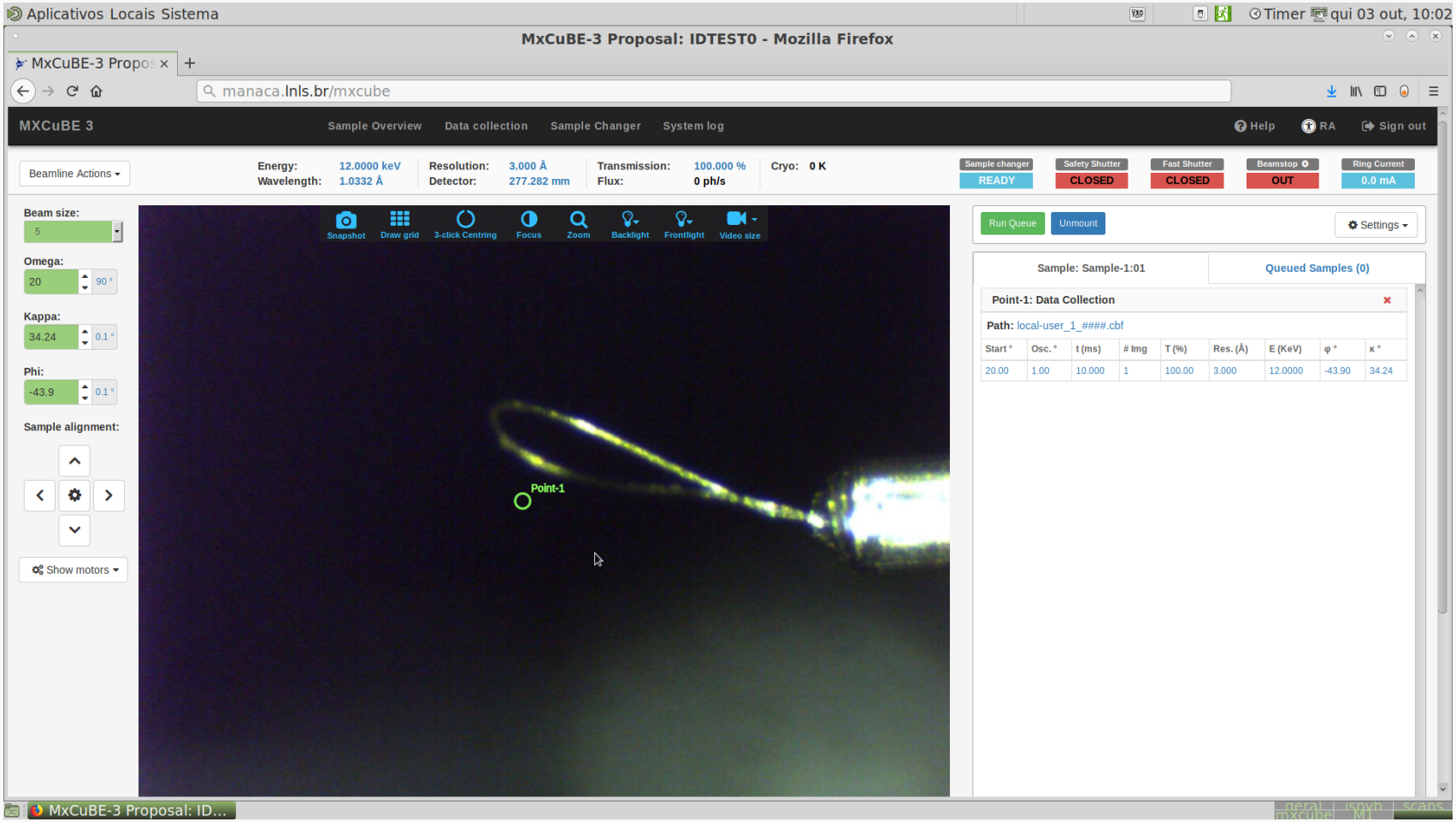
- **MXCuBE 3 + HR 2.2 + EPICS + Docker**
  (Dev / Test)
- **Migration of LNLS Hardware Objects (classes)**
  to this setup
- **EPICS IOCs developments:**
  Motor (Delta Tau), Camera (Arinax B-Zoom), Det (Pi-Mega)

MXCuBE - Status

Done:

Tested classes for MXCuBE3 + EPICS:

- Epics Command
- LNLS Motor
- LNLS Camera (UEye, B-Zoom)
- Machine info (e.g.: ring current and similiar PVs)



MXCuBE 3 developments at MANACÁ

MXCuBE - Status

Done:

ISPyB:

- Docker container for learning and testing
- Improvements discussed with the community
- All merged and available at:
  http://github.com/ispyb/ispyb-docker

MXCuBE - Status

Doing (WIP):

Rebase our code to **MXCuBE3 (master) + HR 3.0**

- Align with upstream
- Python 3 compatibility

More dev/tests on MXCuBE3 + EPICS:

- LNLS Detector (Pilatus, Pi-Mega)
- LNLS MultiCollect

MXCuBE - Status

Repositories?

- http://github.com/lnls-sol/mxcube3
- http://github.com/lnls-sol/HardwareRepository
- http://github.com/lnls-sol/mx3docker

Stable code on branch: lnls-manaca

Future work

MXCuBE

- Auto centering routines
- Caterete (SAXS bl) also interested (BSXCuBE?)
- Serial MX
- Remote access

ISPyB

- 2020: Developments and tests for MANACÁ

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MXCuBE and ISPyB community

References

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Meeting in Brazil? :)

MXCuBE at LNLS/Sirius

Thank you!

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Questions?