Current developments and future perspectives of beamline control environment MXCuBE Qt

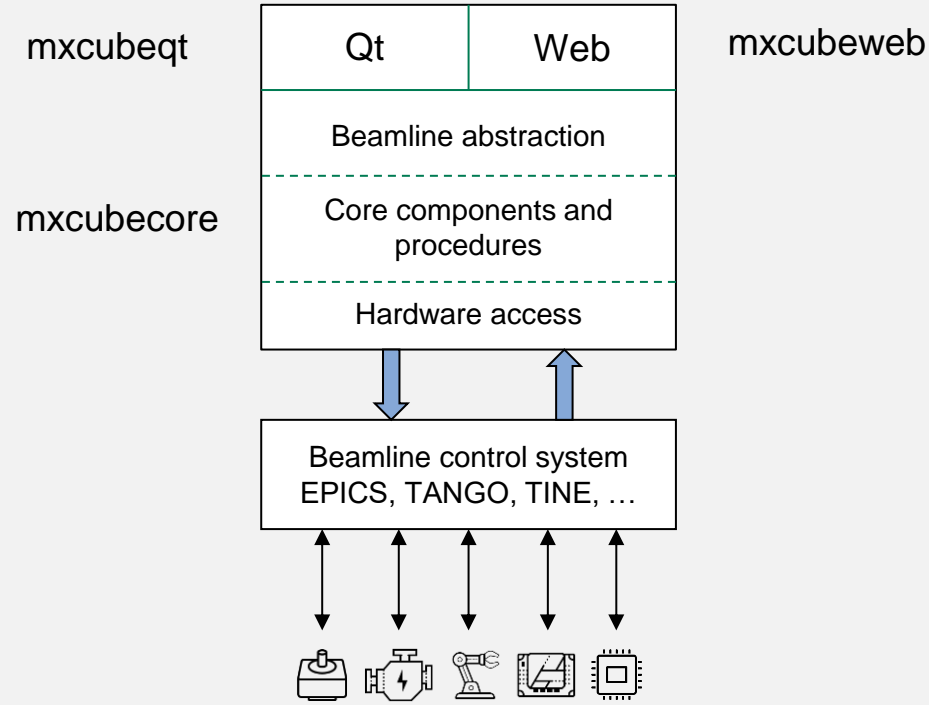**Ivars Karpics**
EMBL Hamburg

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Content

- MXCuBE collaboration
- European Molecular Biology Laboratory and MX beamlines
- MXCuBE Qt frontend
- Future perspectives

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MXCuBE collaboration

- Initially developed by ESRF
- Currently supported by 8 members
- More than 20 beamlines currently uses MXCuBE
- Several prospective members
- Steering, scientific and developers committees
- Monthly developers meetings
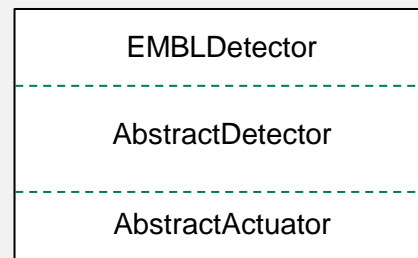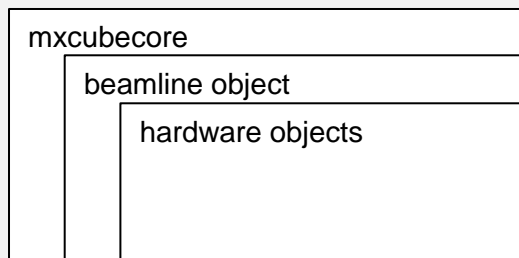- Two full committee meetings per year

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MXCuBE structure

mxcubeqt

| Qt | Web |

mxcubeweb

Beamline abstraction

mxcubecore

Core components and procedures

Hardware access

Beamline control system
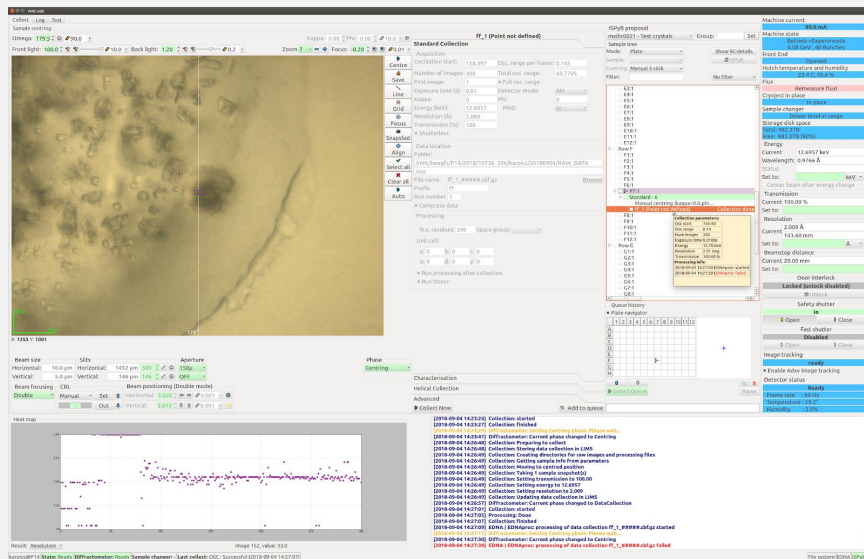EPICS, TANGO, TINE, …

05/04/2021

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MXCuBE core

- Individual configurable python classes defines beamline equipment and procedures.
- Beamline object defines basic set of python objects and provides an unified api to the gui.
- Default values and limits of data collection parameters defined via "beamline" configuration.
- Abstract classes forces to implement methods required by api.
- Extensive set of mockup classes.
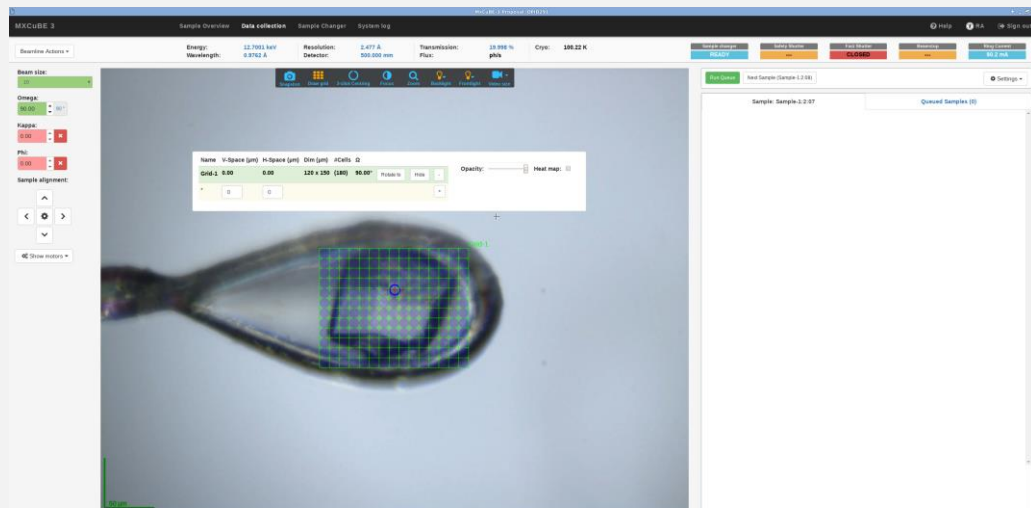- Functional tests and continues integration.

mxcubecore	
beamline object	
	hardware objects

| EMBLDetector |
|---|
| AbstractDetector |
| AbstractActuator |

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MXCuBE frontend

Qt

Web

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MXCuBE Qt

- 2005 - Python Qt3 based on the BlissFramework (internal ESRF development)
- 2012 - introducing gevent
- 2012 - MXCuBE 2: abstract and mockup classes, sample live view
- 2014 - Porting to Qt4/5, PySide
- 2015 - Qt4 version deployed at EMBL-HH
- 2016 - No Qt3 support.
- 2018 - repository clean up and python3 support
- 2019 - api, unit tests and continuous integration
- 2020 - project refactoring
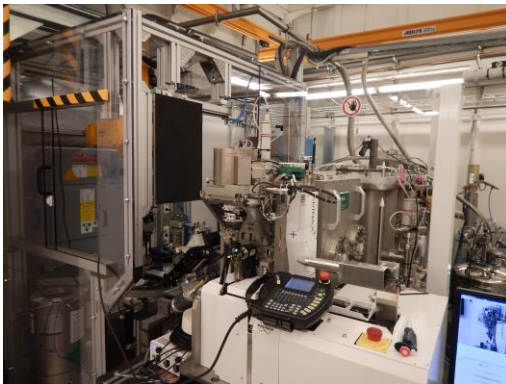- 2021 - mxcubecore, mxcubeqt and mxcubeweb

05/04/2021
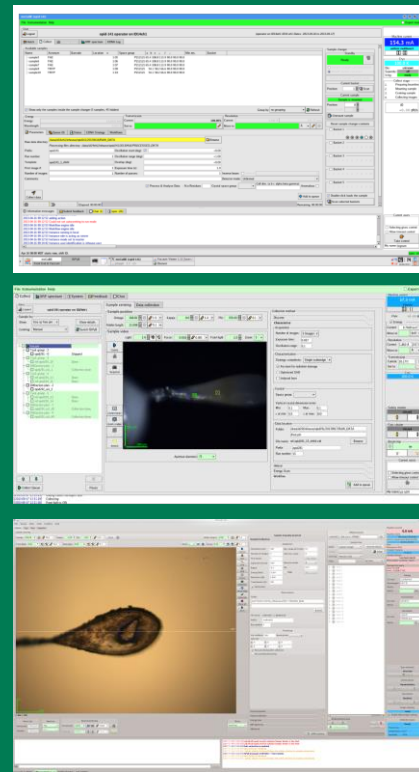
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MX beamlines at EMBL Hamburg
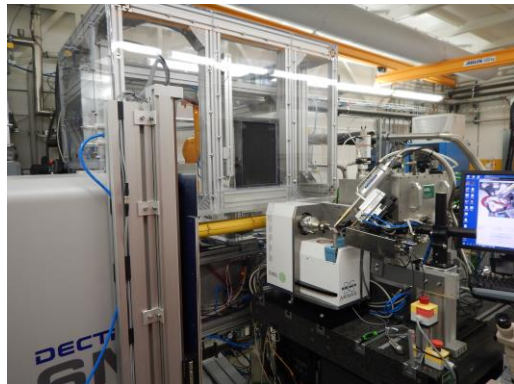
P13

- Variable beam size and high flux
- Tunable energy between 4.5 and 17.5 KeV
- MD2 diffractometer (Arinax)
- Pilatus6MF (Dectris)
- Marvin sample changer (EMBL Hamburg)

P14

- Micro-beam conditions with 5 x 5 micron beam
- Tunable energy and CRLs (ESRF/CINEL)
- MD3 diffractometer (Arinax)
- Eiger16M (Dectris)
- Marvin sample changer (EMBL Hamburg) and plate scanning

PE2 TREXX

- Time resolved pumb/probe experiments
- Beam shaping unit (Arinax)
- Compound reflective lenses CRLs
- Eiger4M (Dectris)

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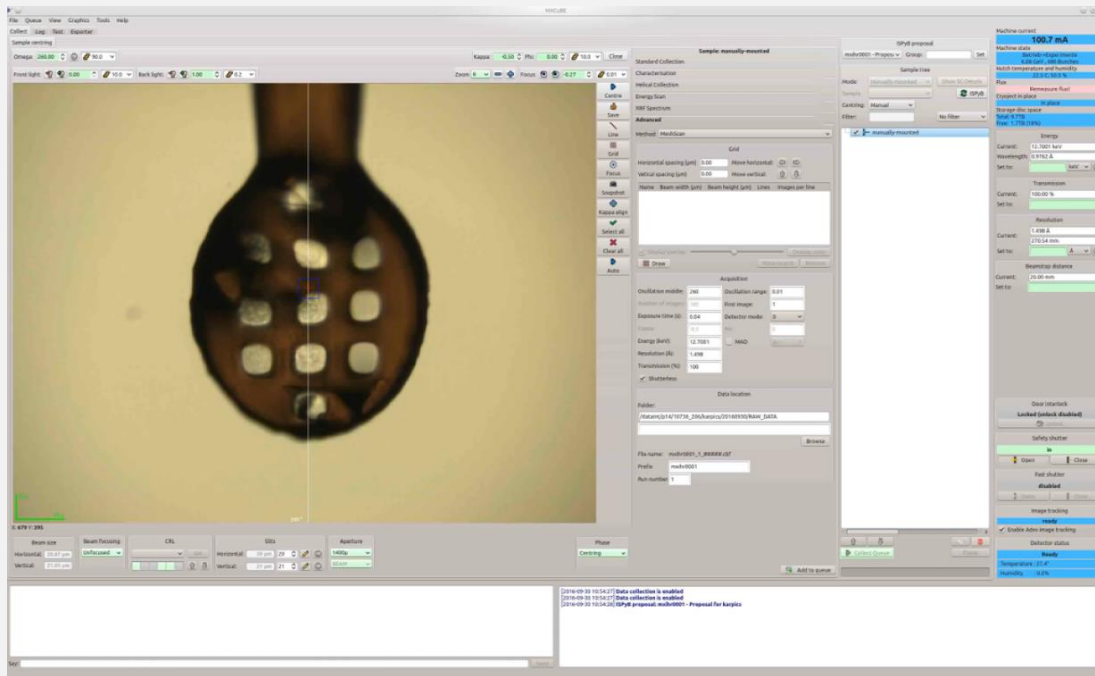
MXCuBE at EMBL Hamburg
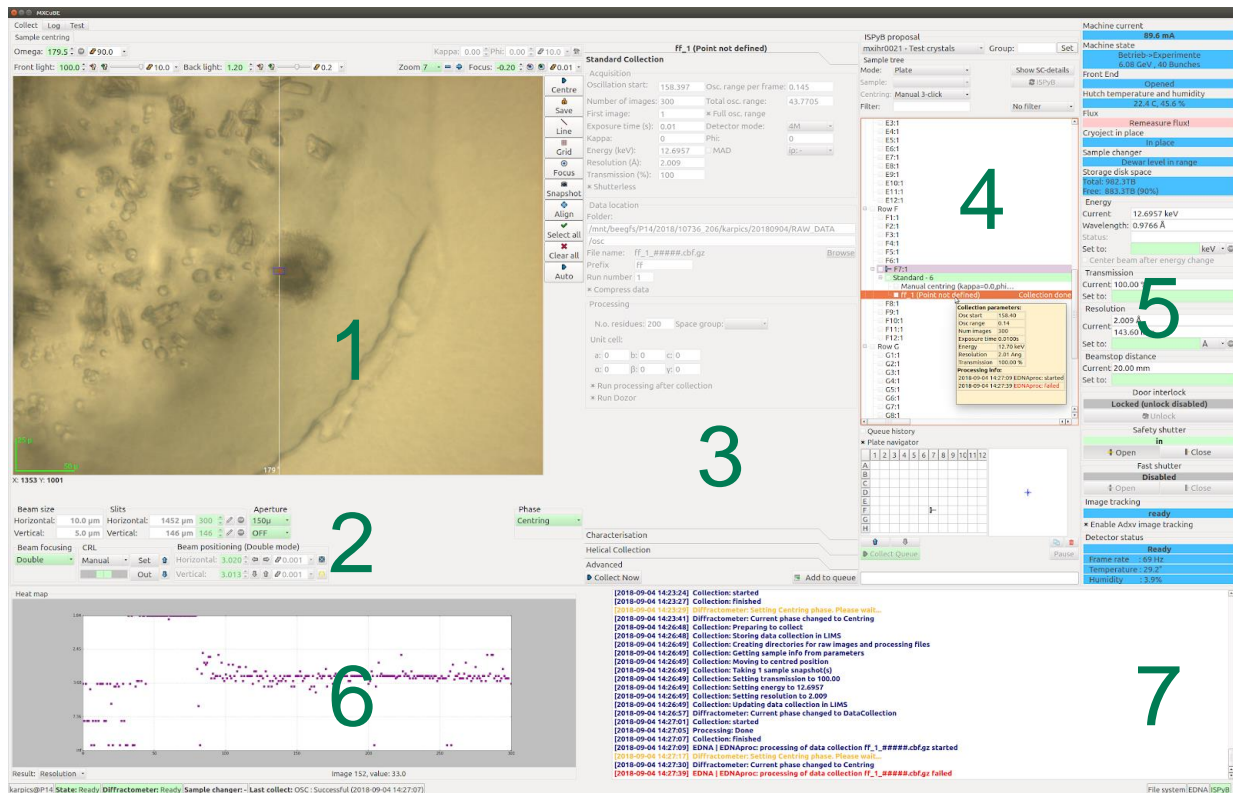
1. Sample view and control
2. Beam characteristics
3. Task menu
4. Queue
5. Beamline control
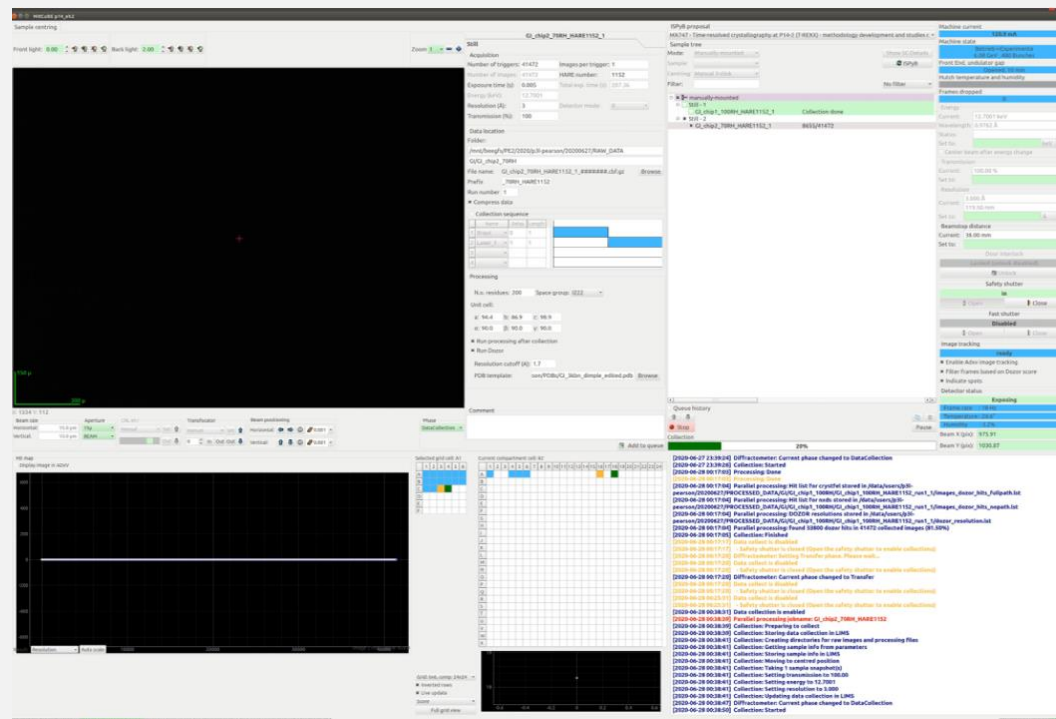6. Online processing results
7. Logging

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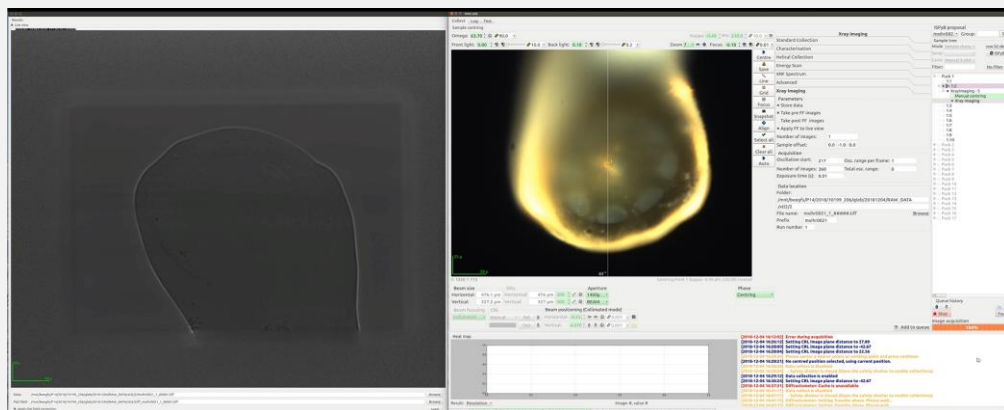# Beam characteristics
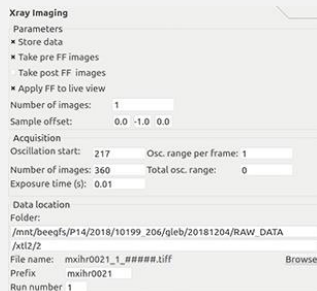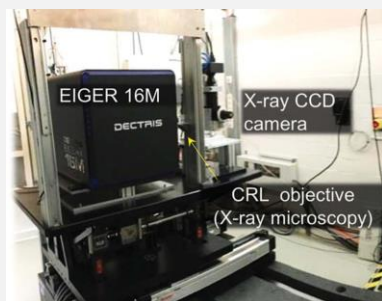
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Mesh and collect

Serial crystallography

von Stetten, D. et al. (2019). Acta Cryst. A75, e26

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Phase contrast xray imaging

Polikarpov, M. et al. (2019). Acta Cryst. D75, 947–958

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Future perspectives

- DataPublisher
- Extended and configurable queue and tasks
- State persistence and message broker (apache airflow, kafka, redis)
- Not just MX

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Thank you for your attention