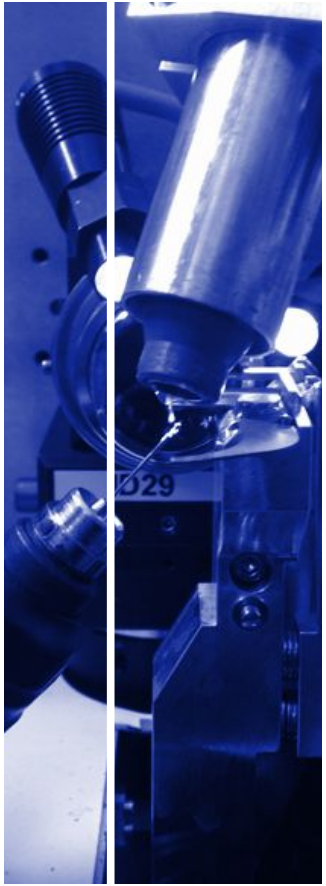
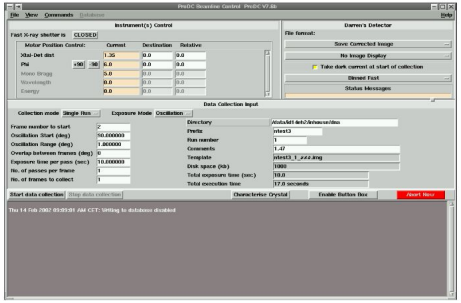
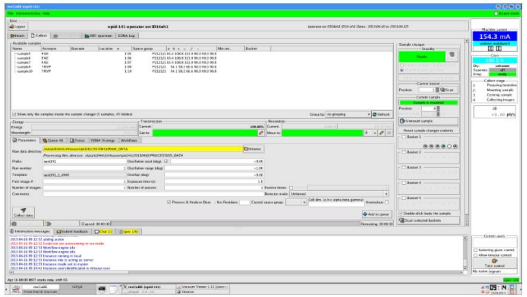


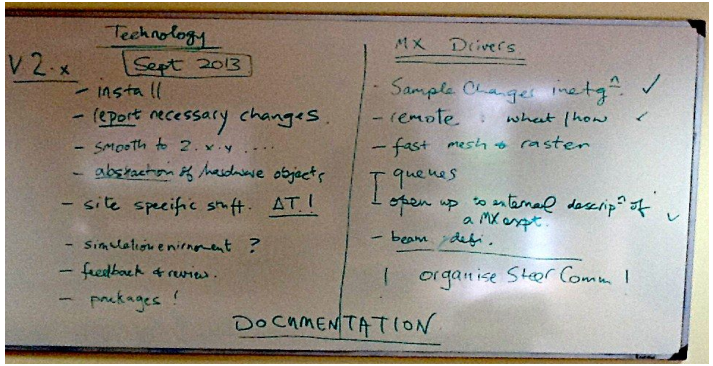
MXCuBE3 @ ESRF

Daniele de Sanctis
daniele.de_sanctis@esrf.fr

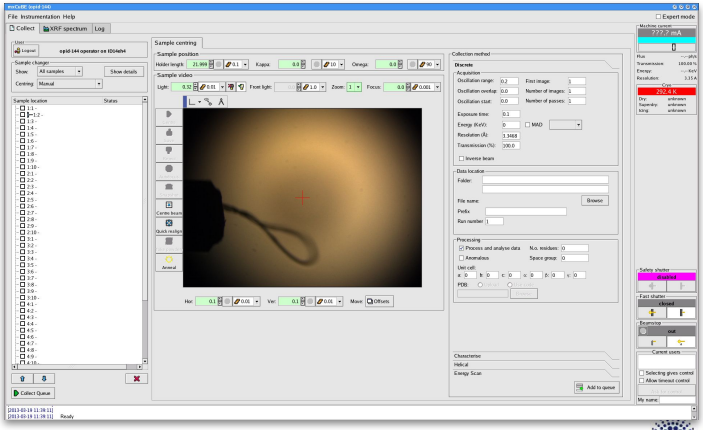
THE ORIGINS





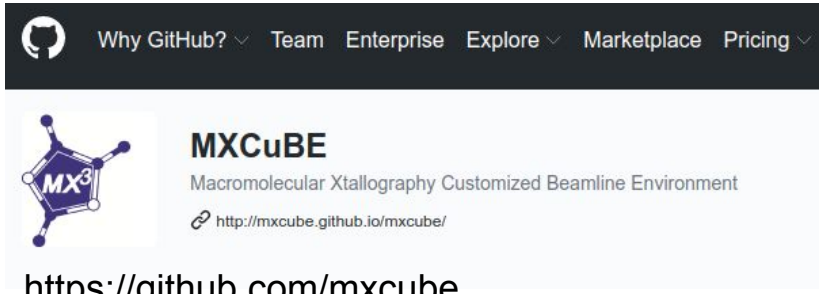


- MXCuBE1 was used for a long time at ESRF
- Eventually installed at Soleil, MAXLab, Bessy, EMBL-HH
- But presented some limitations
  - Capacity of sample changer increased
  - Microbeam capabilities needed to be exploited
  - Complexity of data collection increased
  - Hard to install elsewhere, too many ESRF dependencies (spec *in primis*)
- These common needs paved the way to the design of MXCuBE2 and the begin of the MXCuBE collaboration



THE MXCUBE COLLABORATION

On MXCuBE the sun never sets

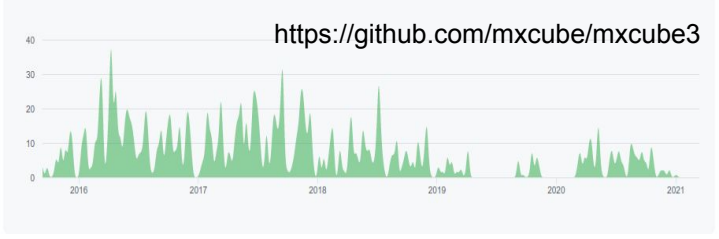


https://github.com/mxcube

Oscarsson et al. 2019. “MXCuBE2: The Dawn of MXCuBE Collaboration.” *Journal of Synchrotron Radiation* 26 (Pt 2): 393–405.

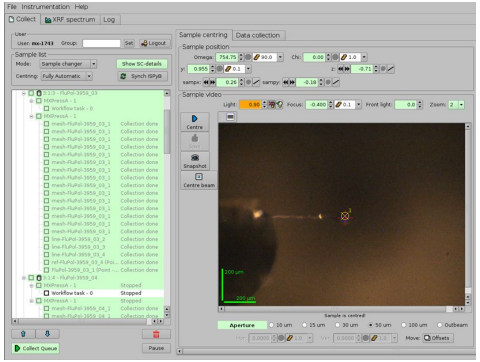
THE MXCUBE COLLABORATION

Partners meet twice a year in round robin (jointly with ISPyB)
Collaboration very dynamic both on core and front end



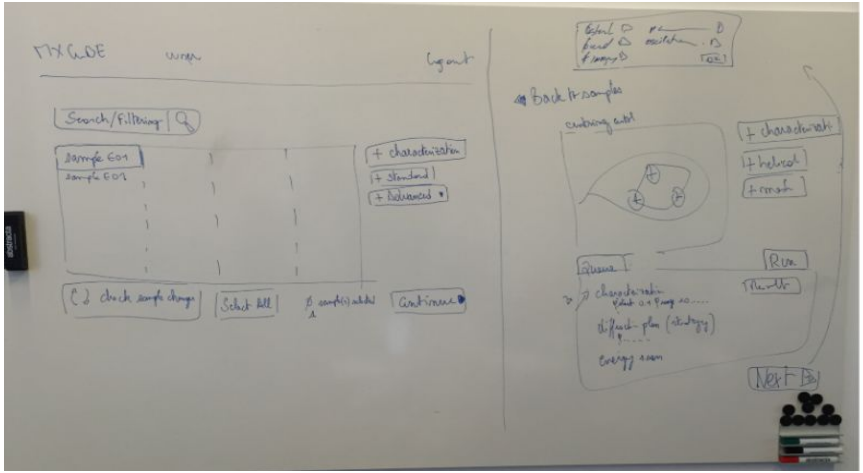
THE DAWN OF MXCUBE3

- MXCuBE2 was released in May 2012
- Designed in (ESRF) FW2 based on Qt3
- Eventually deployed at other sites
- Ported to Qt4 by EMBL-HH



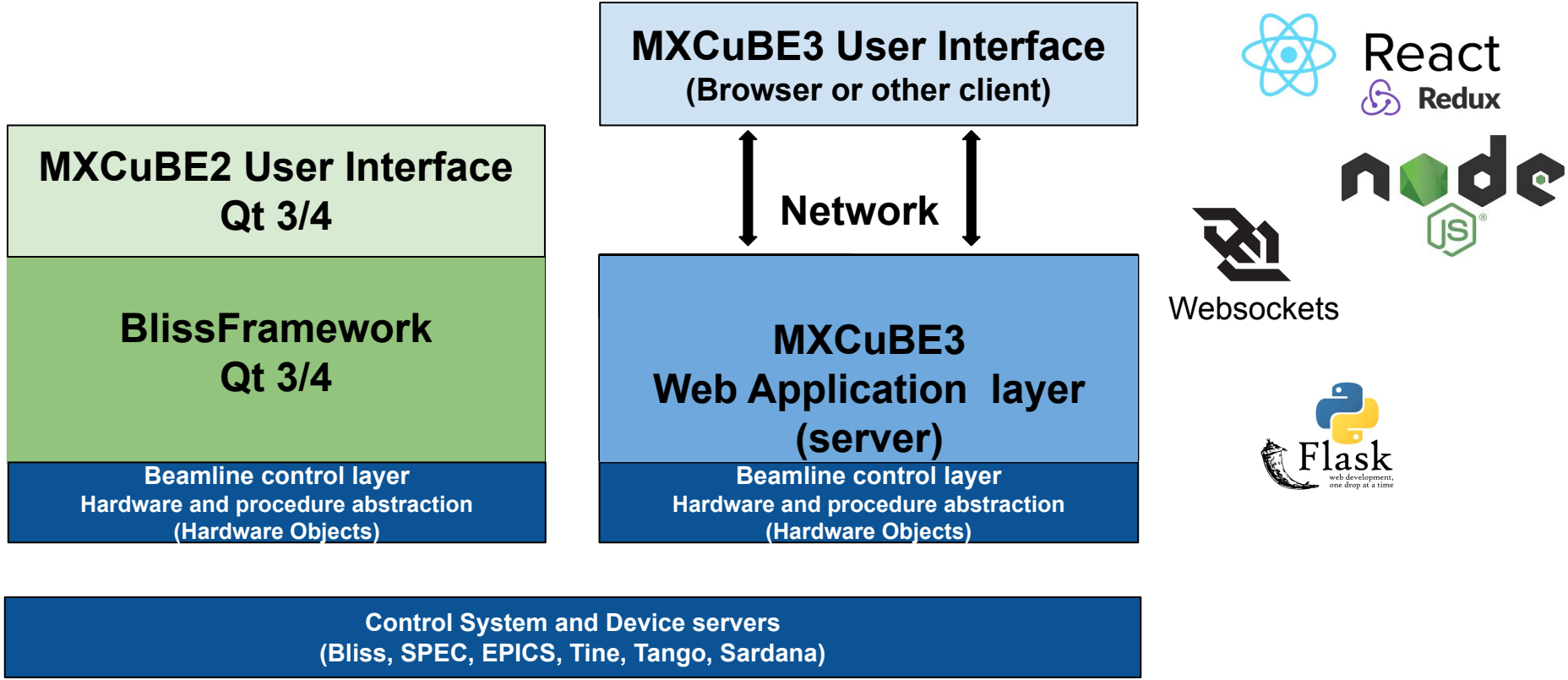
But in the meantime:

- New generation of pixel detectors
- Higher capacity sample changers
- New tools for automated data collection (workflows)
- More demand for Remote access



- Collaboration between ESRF and MAXIV initiated the MXCuBE3 project
- Design a new interface in web technology
- Preserve a common backend with MXCuBE core (Hardware repository)

MXCUBEQT AND MXCUBE3



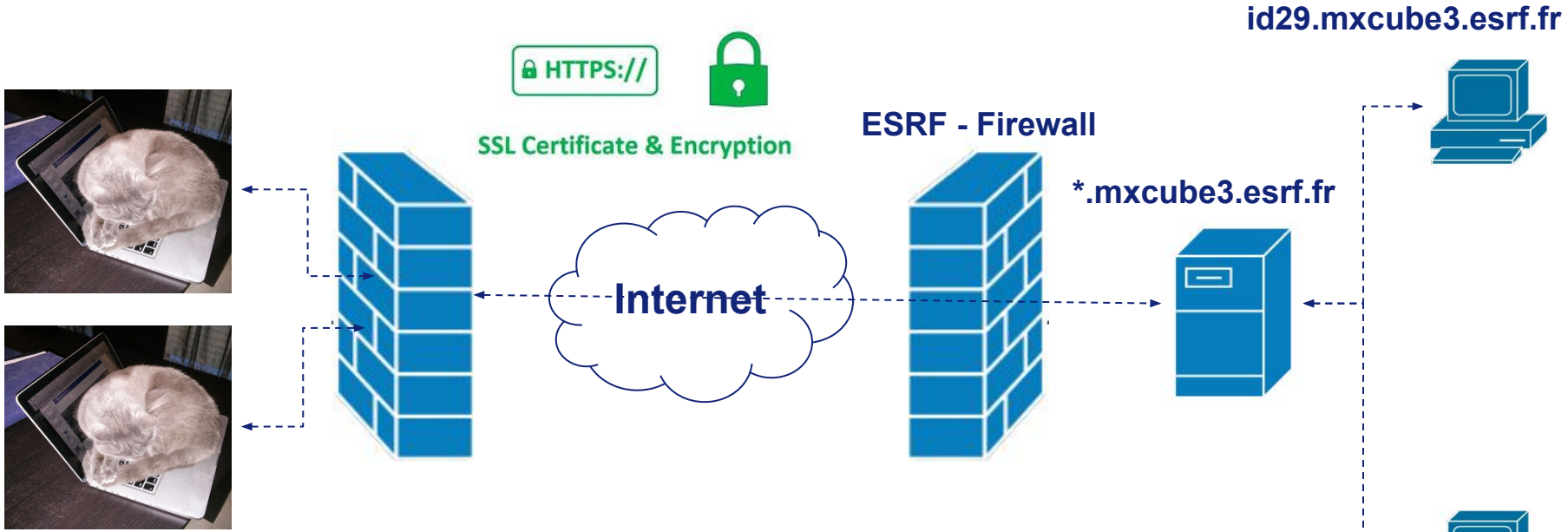
FROM SCIENTIFIC DRIVERS TO WEB

- High-throughput data collection
  - Fully exploit automation
  - Apt to perform more elaborated data collection for complex experiments
- Adaptable to any hardware and control environment
  - Independent from the underlying control system
- Scalable with time
- Interface with external experiment descriptors BES and Global Phasing Workflows

Why web?

- Allows for a more graphical experience with direct interaction with the samples
- Lighter interface
- Remote by design
- No need of extra software installation on the client side
- Modern technology
- It scales well on any screen size
- Fast to modify and maintain
- Smooth integration with ISPyB

JUST A BROWSER



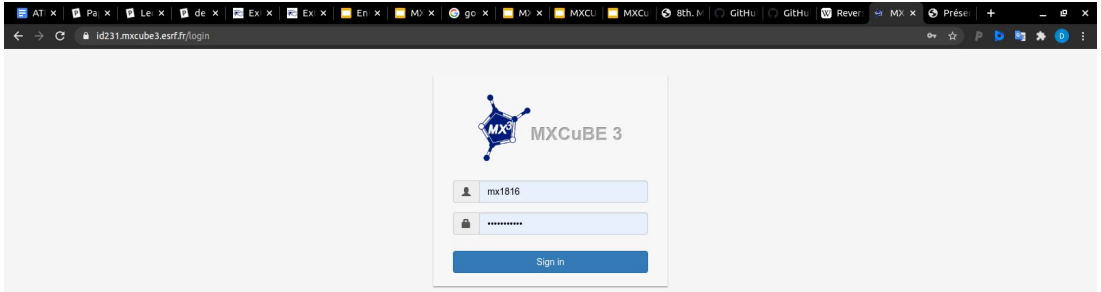
At ESRF Shutdown (December 2018) MXCuBE3 was running on ID29 and ID23-2

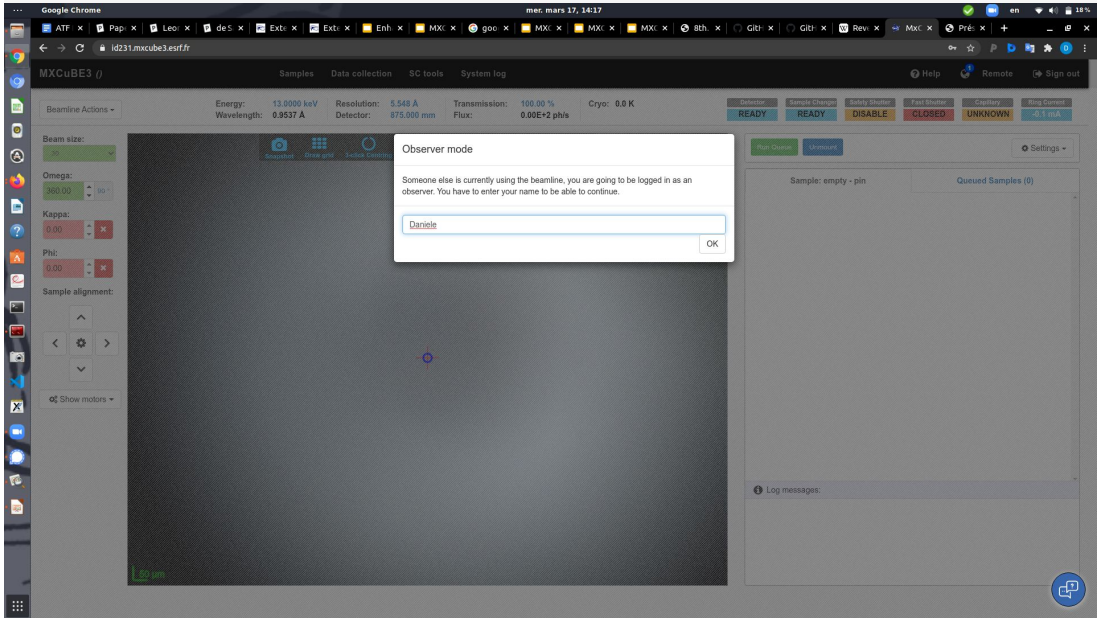
ESRF-EBS restarted in complete remote user operation in August 2020

MXCuBE3 used at **ID23-1**, **ID23-2**, **ID30A1**, **ID30A3**, **ID30B**, (soon again on ID29) for 525 user sessions since the restart

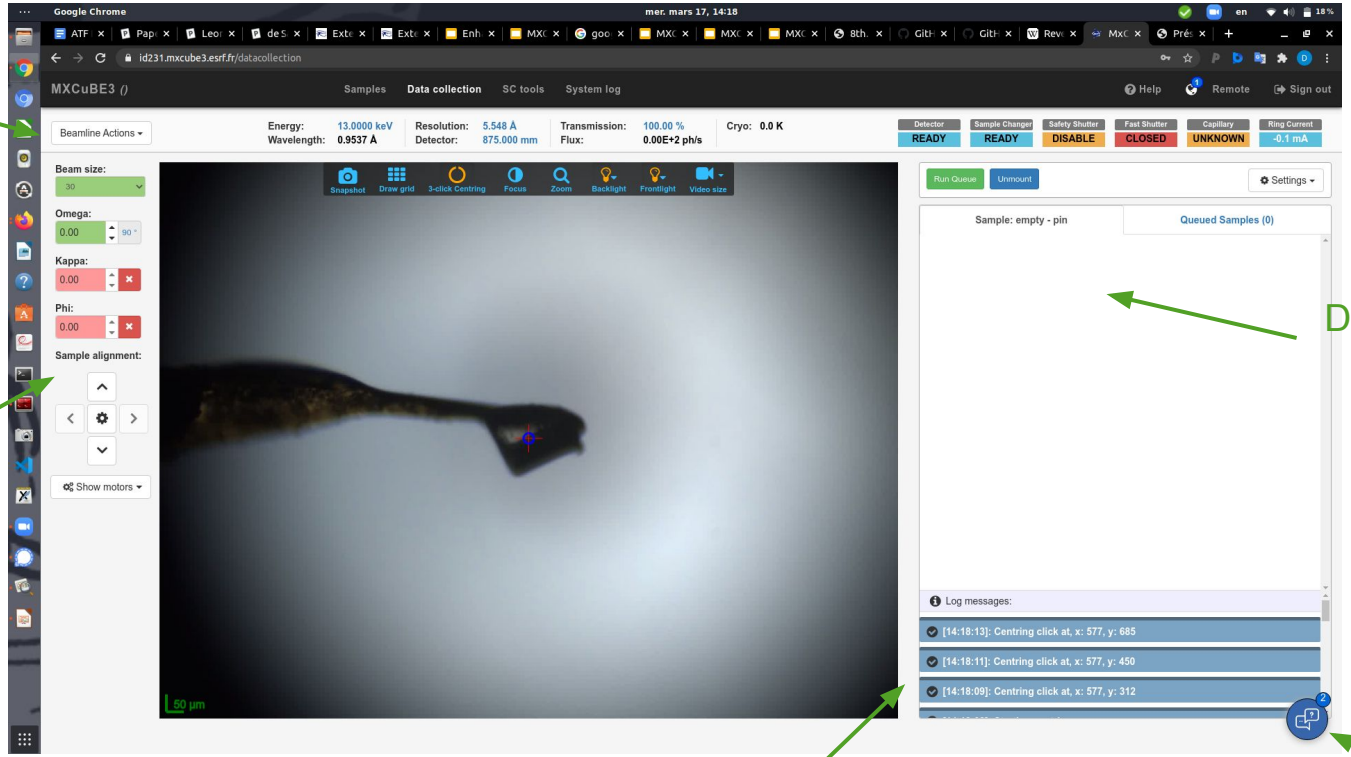
MXCuBE3

- Directly accessible from any browser from https://mxcube3.esrf.fr
- Remote login with proposal account (soon with personal account)
- When experiment is scheduled and local session allows
- Users from same experiment session can login simultaneously, only one in control
- Users can exchange control without local intervention





MXCuBE3 LAYOUT



Beamline setup

Goniometer motors control Sample joystick

Data collection queue

User logging

Chat

Shift + dblclick → Move to beam
R+scroll → Rotate spindle
Z+scroll → zoom

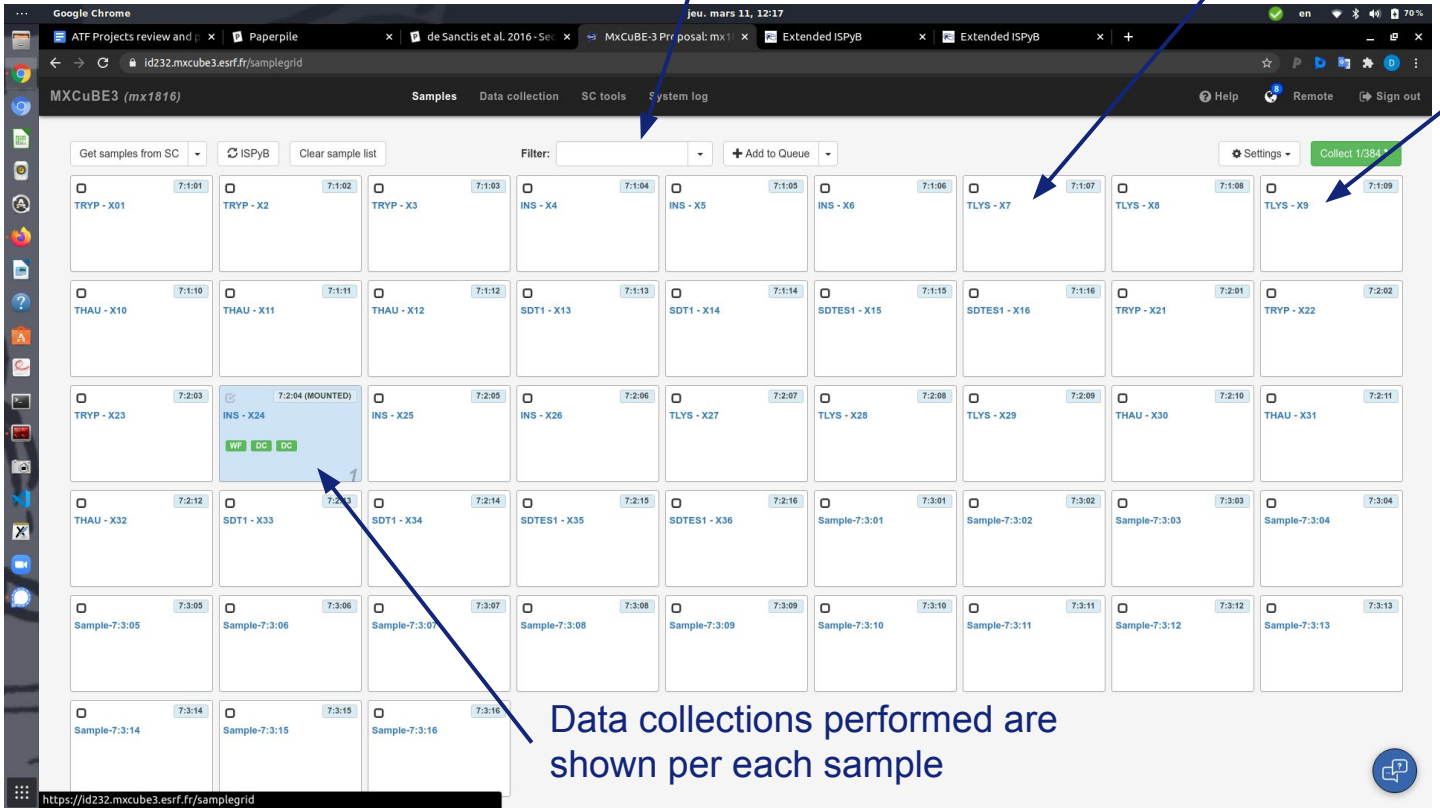
SAMPLES

Only present pucks are displayed

Smart filtering (name, position, …)

Each card a sample

Sample name retrieved from ISPyB



Data collections performed are shown per each sample

THE CONCEPT

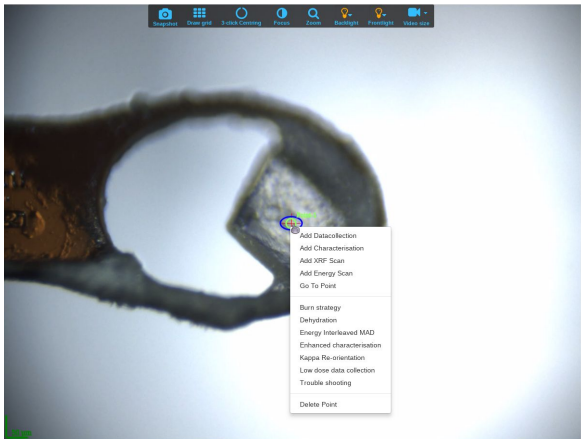
Sample(s)

Position, line, grid

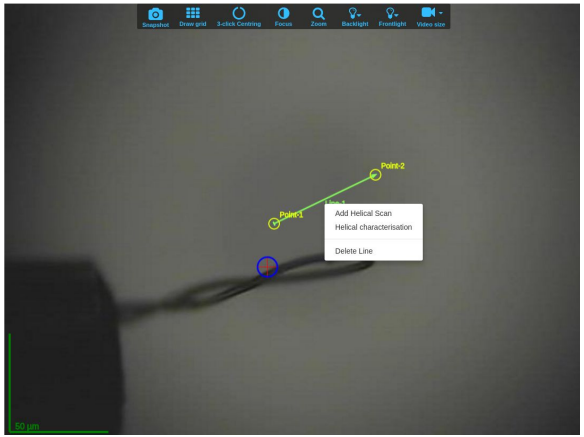
Data collection method

This is the basis to build any complex data collection sequence (automatically when combined with workflows)

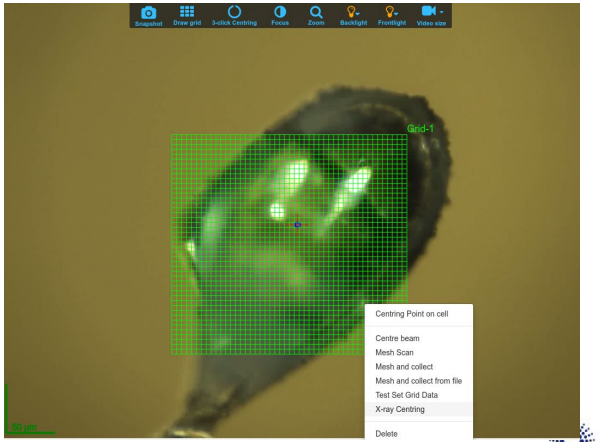
Point (3D or 2D)



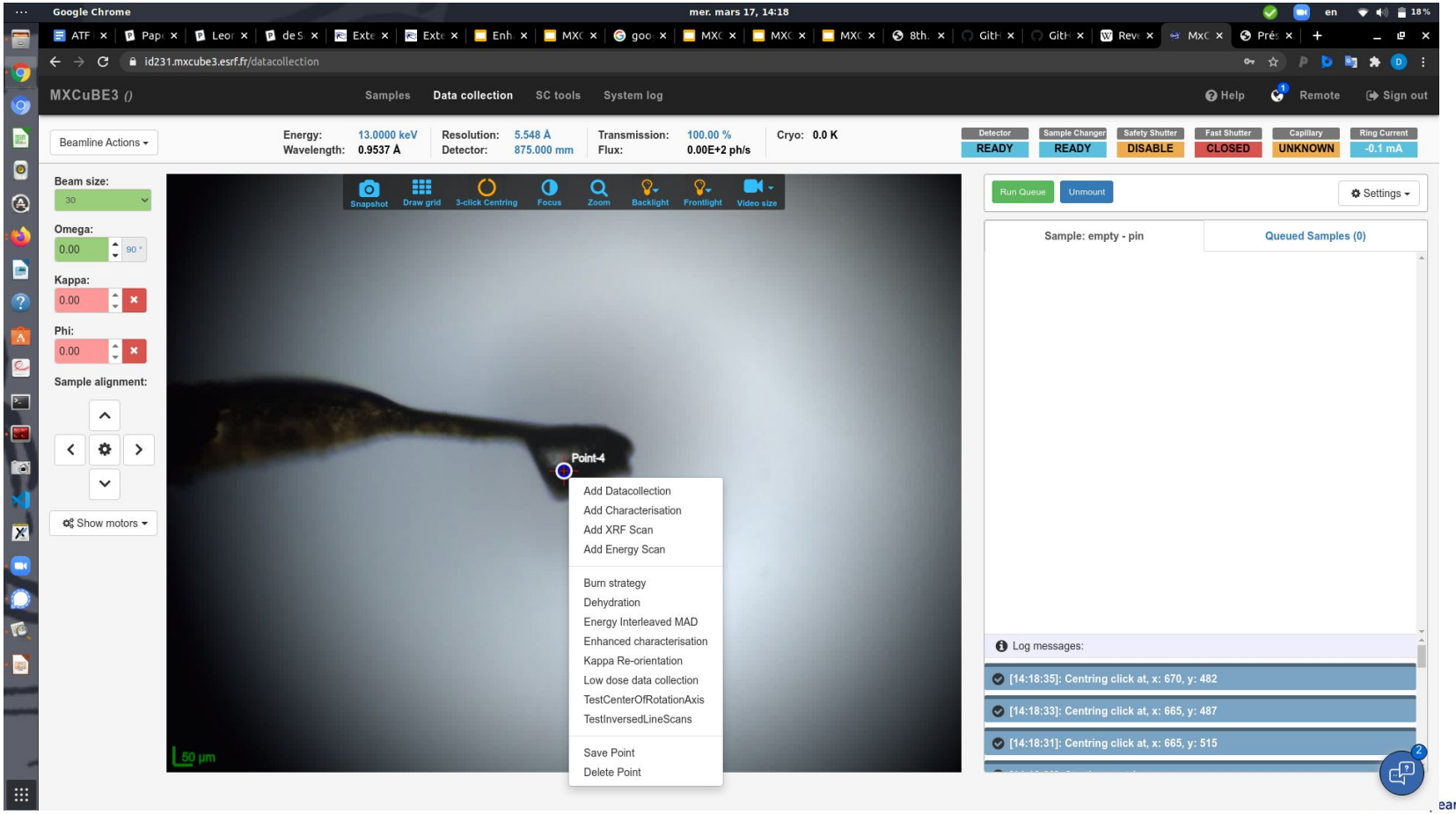
Line



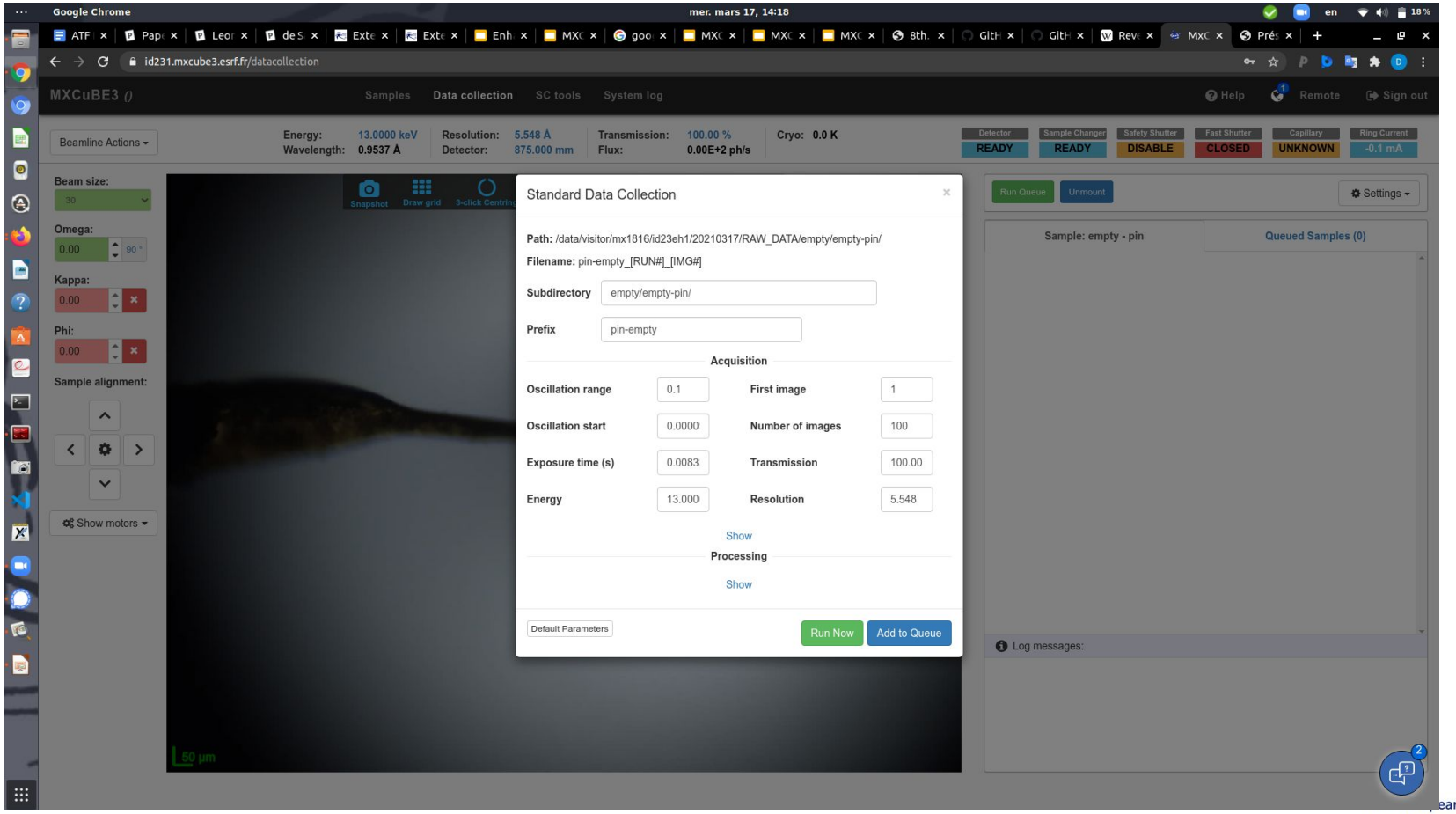
Grid



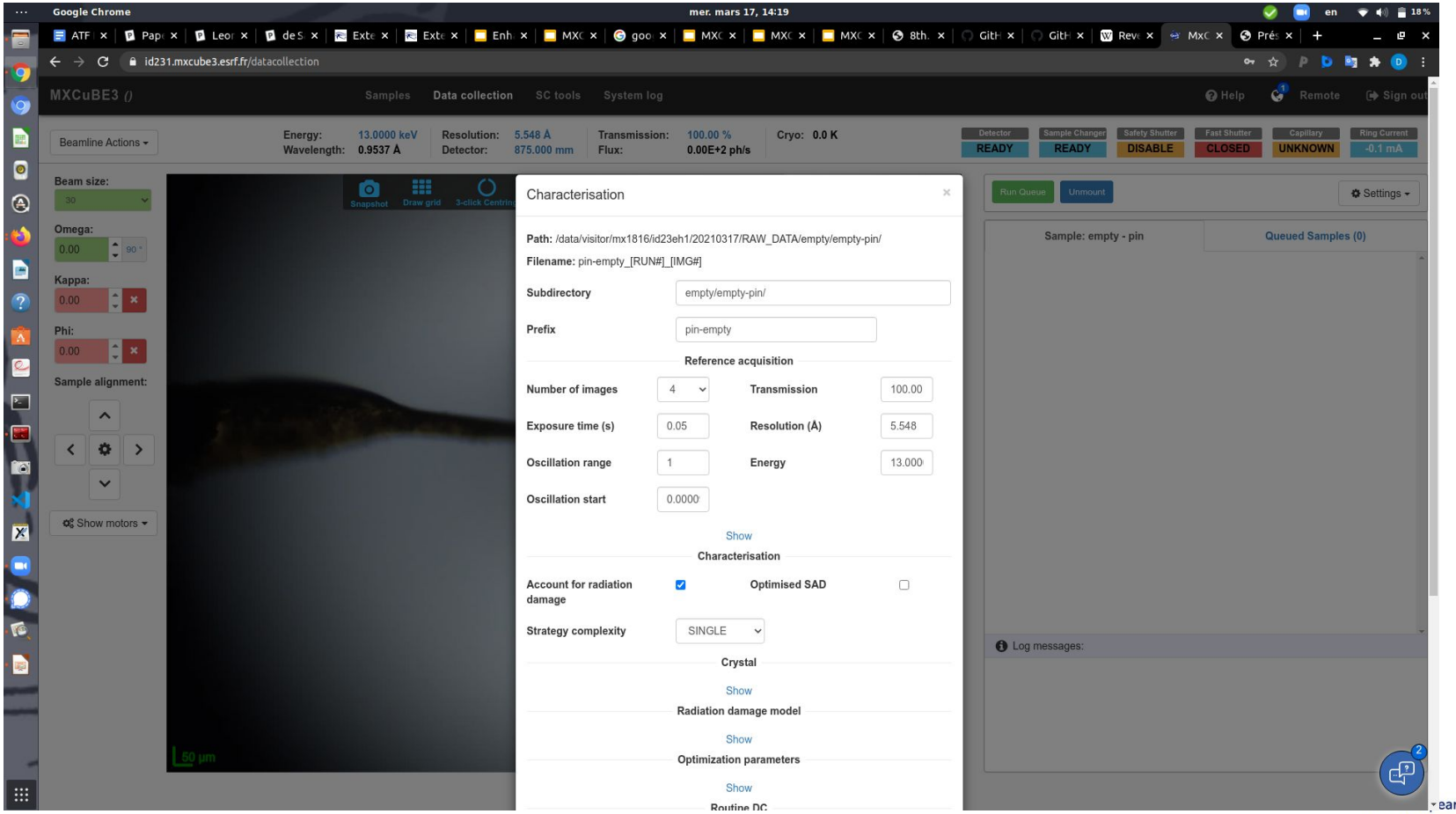
POINT


Google Chrome
mer. mars 17, 14:18
id231.mxcube3.esrf.fr/datacollection
MXCuBE3
Samples
Data collection
SC tools
System log
Help
Remote
Sign out
Beamline Actions
Energy: 13.0000 keV
Wavelength: 0.9537 Å
Resolution: 5.548 Å
Detector: 875.000 mm
Transmission: 100.00 %
Flux: 0.00E+2 ph/s
Cryo: 0.0 K
Detector READY
Sample Changer READY
Safety Shutter DISABLE
Fast Shutter CLOSED
Capillary UNKNOWN
Ring Current -0.1 mA
Beam size:
Omega:
Kappa:
Phi:
Sample alignment:
Show motors
Snapshot
Draw grid
3-click Centring
Focus
Zoom
Backlight
Frontlight
Video size
Point-4
Add Datacollection
Add Characterisation
Add XRF Scan
Add Energy Scan
Burn strategy
Dehydration
Energy Interleaved MAD
Enhanced characterisation
Kappa Re-orientation
Low dose data collection
TestCenterOfRotationAxis
TestInversedLineScans
Save Point
Delete Point
50 µm
Run Queue
Unmount
Settings
Sample: empty - pin
Queued Samples (0)
Log messages:
[14:18:35]: Centring click at, x: 670, y: 482
[14:18:33]: Centring click at, x: 665, y: 487
[14:18:31]: Centring click at, x: 665, y: 515

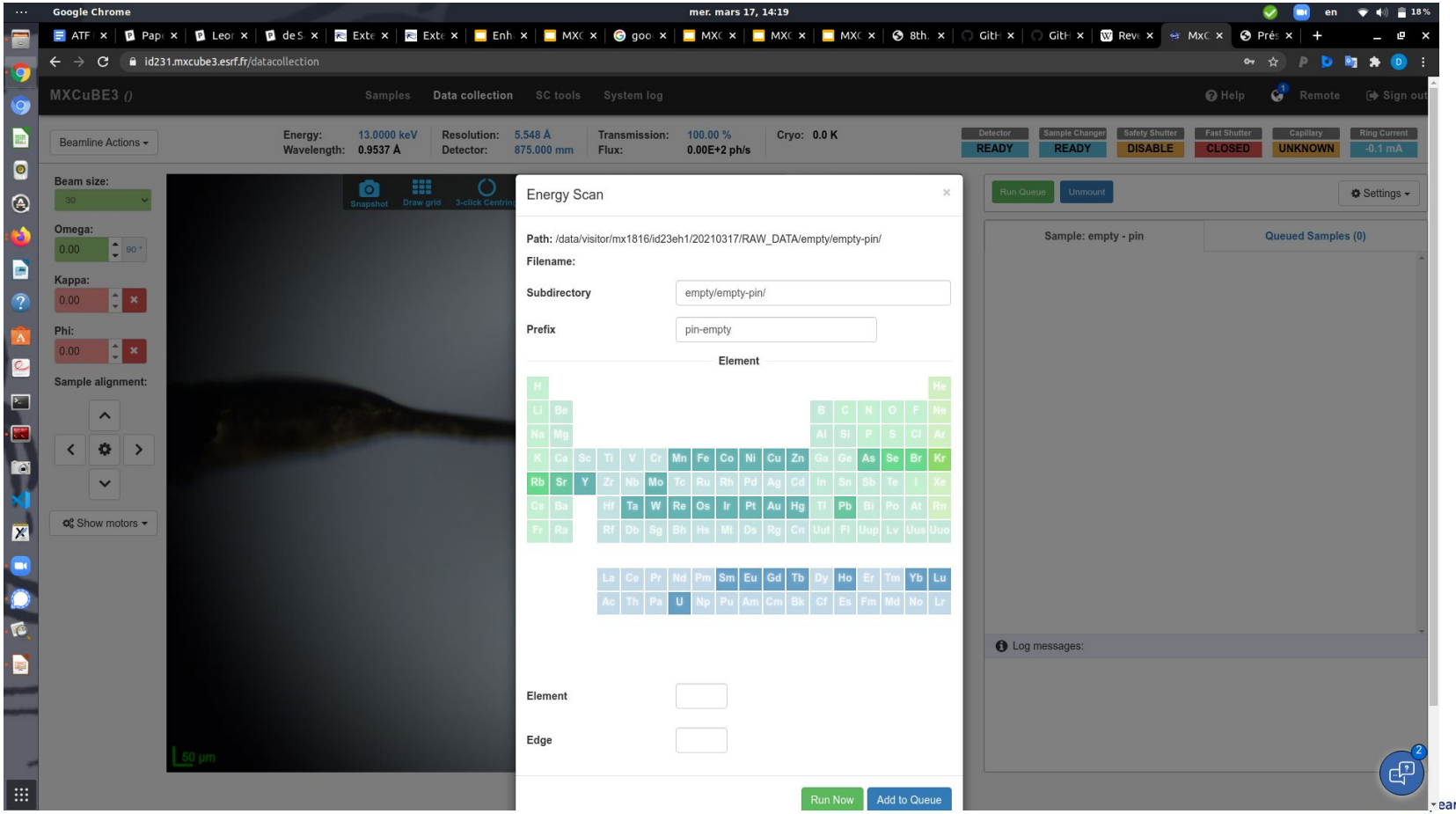
DATA COLLECTION



CHARACTERISATION



ENERGY SCAN


Google Chrome
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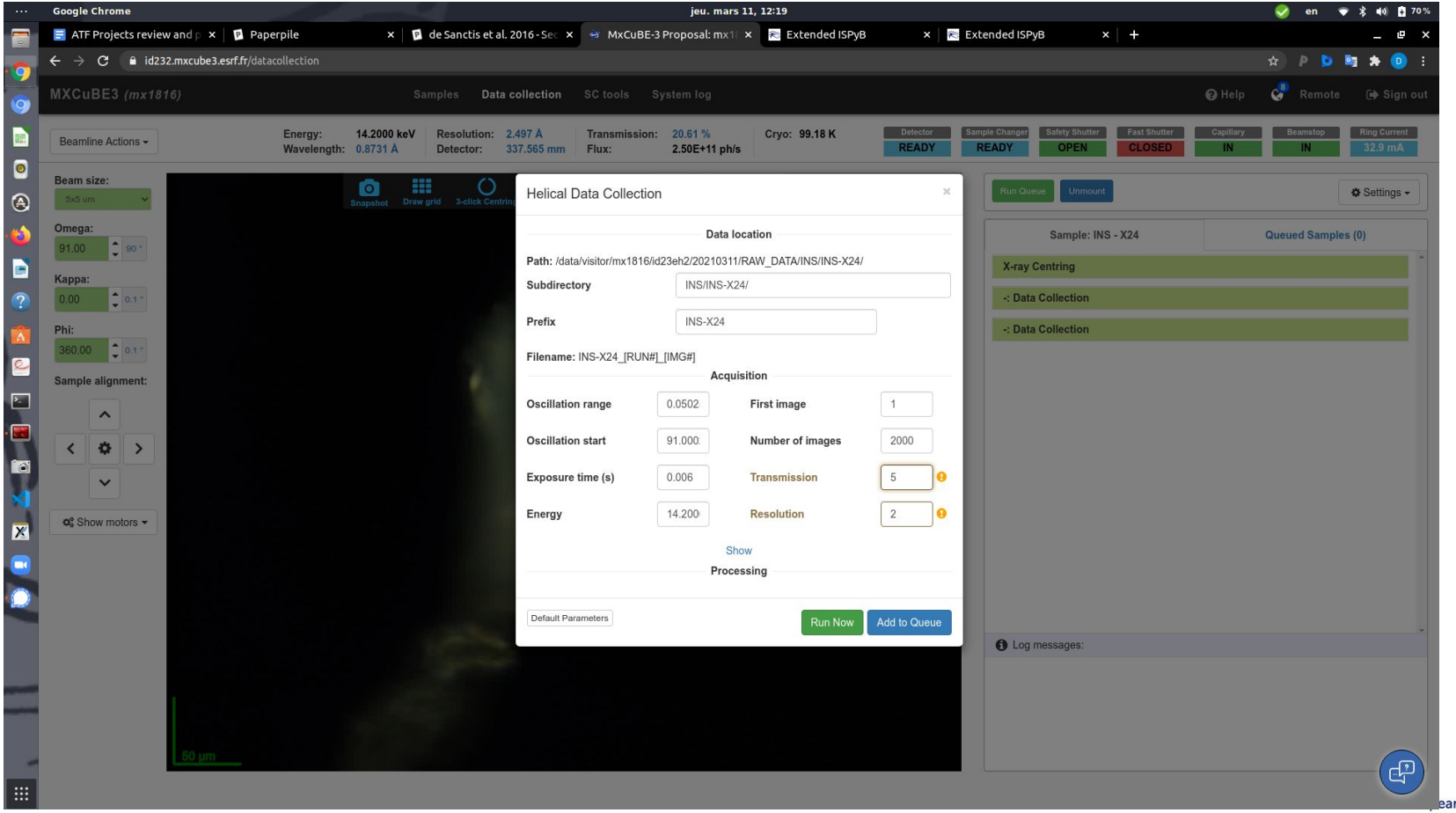
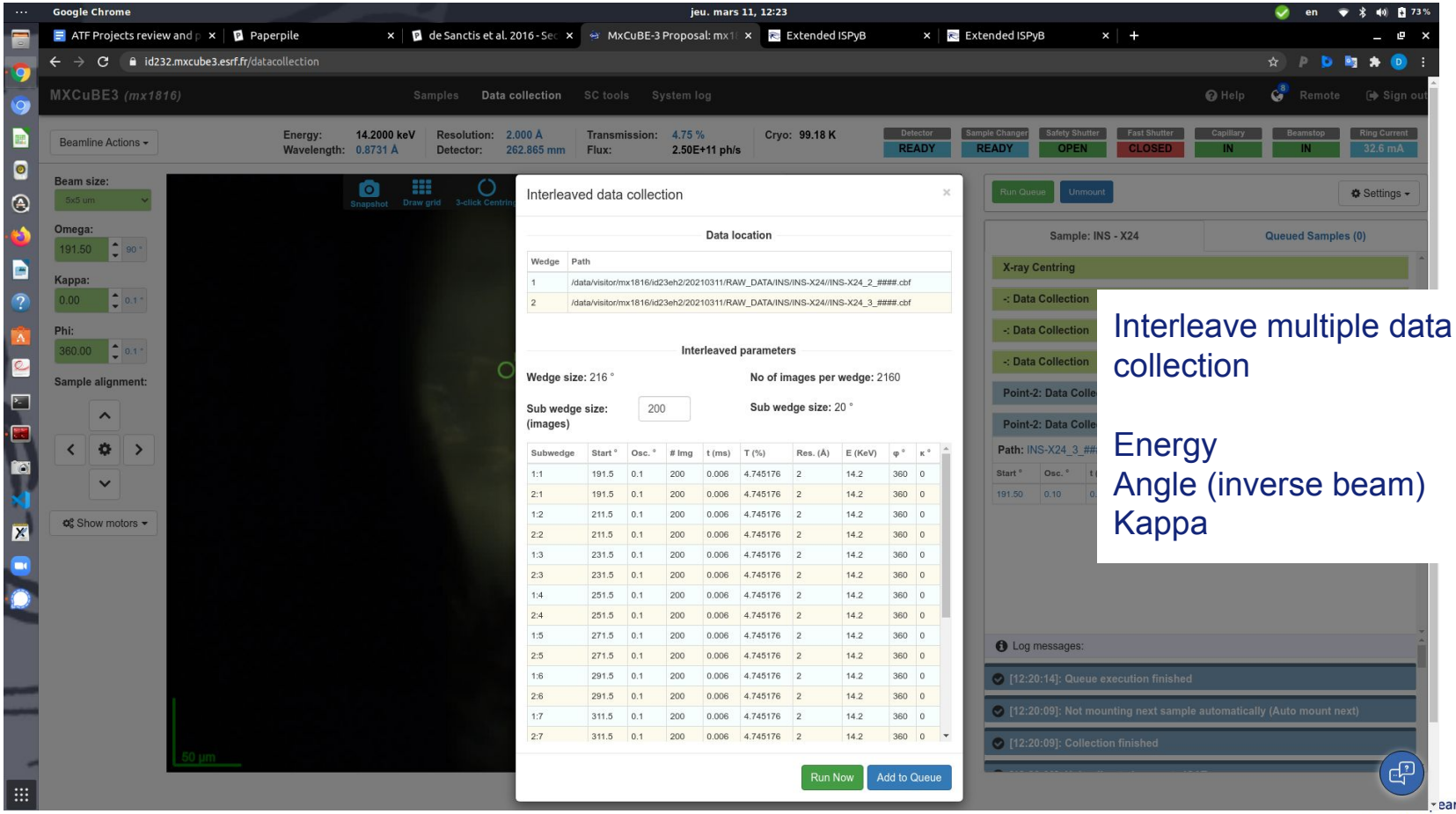
id231.mxcube3.esrf.fr/datacollection
MXCuBE3
Samples
Data collection
SC tools
System log
Help
Remote
Sign out
Beamline Actions
Energy: 13.0000 keV
Wavelength: 0.9537 Å
Resolution: 5.548 Å
Detector: 875.000 mm
Transmission: 100.00 %
Flux: 0.00E+2 ph/s
Cryo: 0.0 K
Detector READY
Sample Changer READY
Safety Shutter DISABLE
Fast Shutter CLOSED
Capillary UNKNOWN
Ring Current -0.1 mA
Beam size:
Omega:
Kappa:
Phi:
Sample alignment:
Show motors
Snapshot
Draw grid
3-click Centring
50 µm
Energy Scan
Path: /data/visitor/mx1816/id23eh1/20210317/RAW_DATA/empty/empty-pin/
Filename:
Subdirectory
empty/empty-pin/
Prefix
pin-empty
Element
Element
Edge
Run Now
Add to Queue
Run Queue
Unmount
Settings
Sample: empty - pin
Queued Samples (0)
Log messages:

HELICAL


Google Chrome
jeu. mars 11, 12:19
ATF Projects review and p
Paperpile
de Sanctis et al. 2016 - Sec
MxCuBE-3 Proposal: mx1
Extended ISPyB
Extended ISPyB
id232.mxcube3.esrf.fr/datacollection
MXCuBE3 (mx1816)
Samples
Data collection
SC tools
System log
Help
Remote
Sign out
Beamline Actions
Energy: 14.2000 keV
Wavelength: 0.8731 Å
Resolution: 2.497 Å
Detector: 337.565 mm
Transmission: 20.61 %
Flux: 2.50E+11 ph/s
Cryo: 99.18 K
Detector READY
Sample Changer READY
Safety Shutter OPEN
Fast Shutter CLOSED
Capillary IN
Beamstop IN
Ring Current 32.9 mA
Beam size:
5x5 um
Omega:
91.00
Kappa:
0.00
Phi:
360.00
Sample alignment:
Show motors
Snapshot
Draw grid
3-click Centring
50 µm
Helical Data Collection
Data location
Path: /data/visitor/mx1816/id23eh2/20210311/RAW_DATA/INS/INS-X24/
Subdirectory
INS/INS-X24/
Prefix
INS-X24
Filename: INS-X24_[RUN#]_[IMG#]
Acquisition
Oscillation range
0.0502
First image
1
Oscillation start
91.000
Number of images
2000
Exposure time (s)
0.006
Transmission
5
Energy
14.200
Resolution
2
Show
Processing
Default Parameters
Run Now
Add to Queue
Run Queue
Unmount
Settings
Sample: INS - X24
Queued Samples (0)
X-ray Centring
-: Data Collection
-: Data Collection
Log messages:

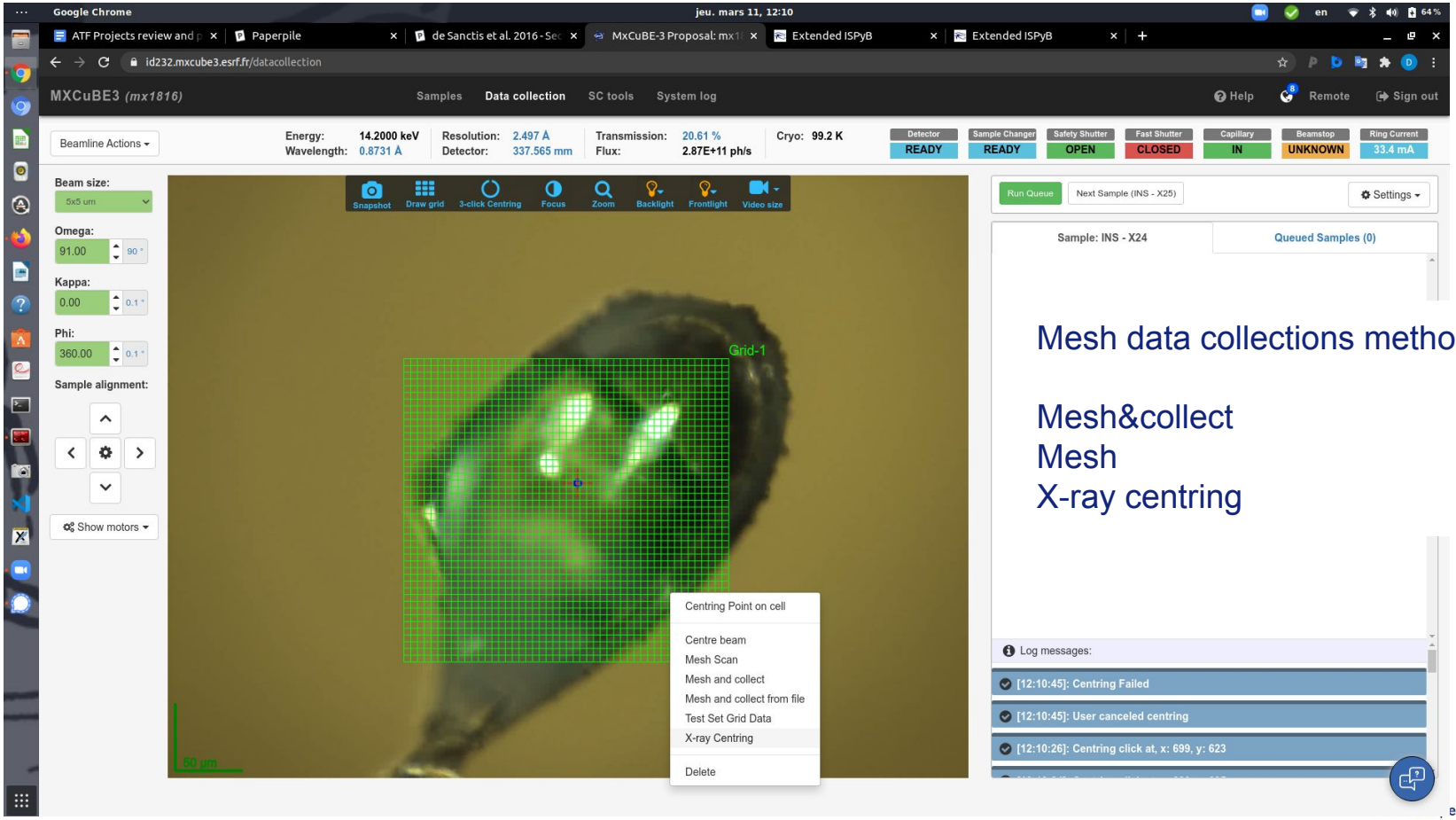
INTERLEAVED



Interleave multiple data collection

Energy
Angle (inverse beam)
Kappa

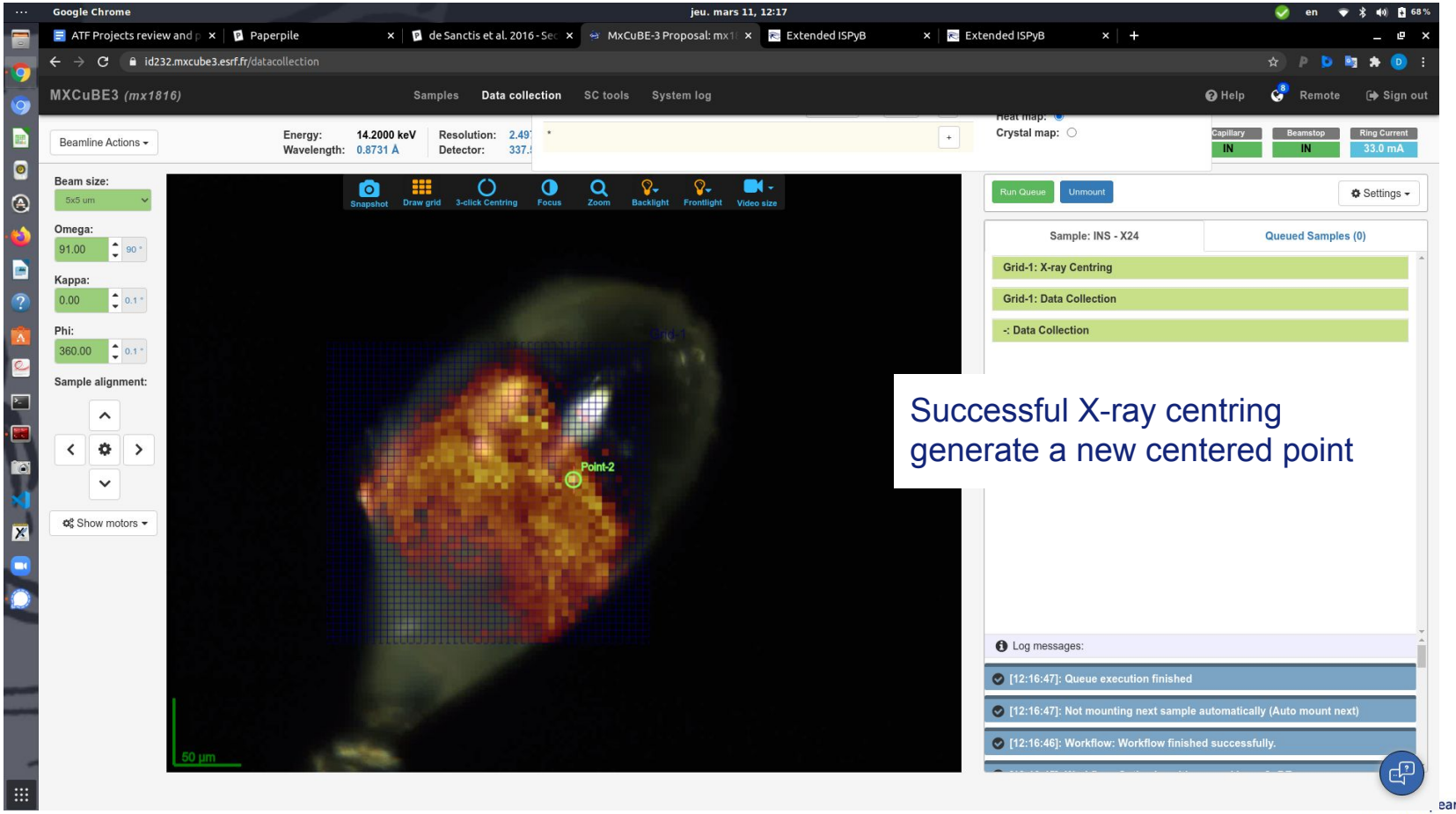
MESH



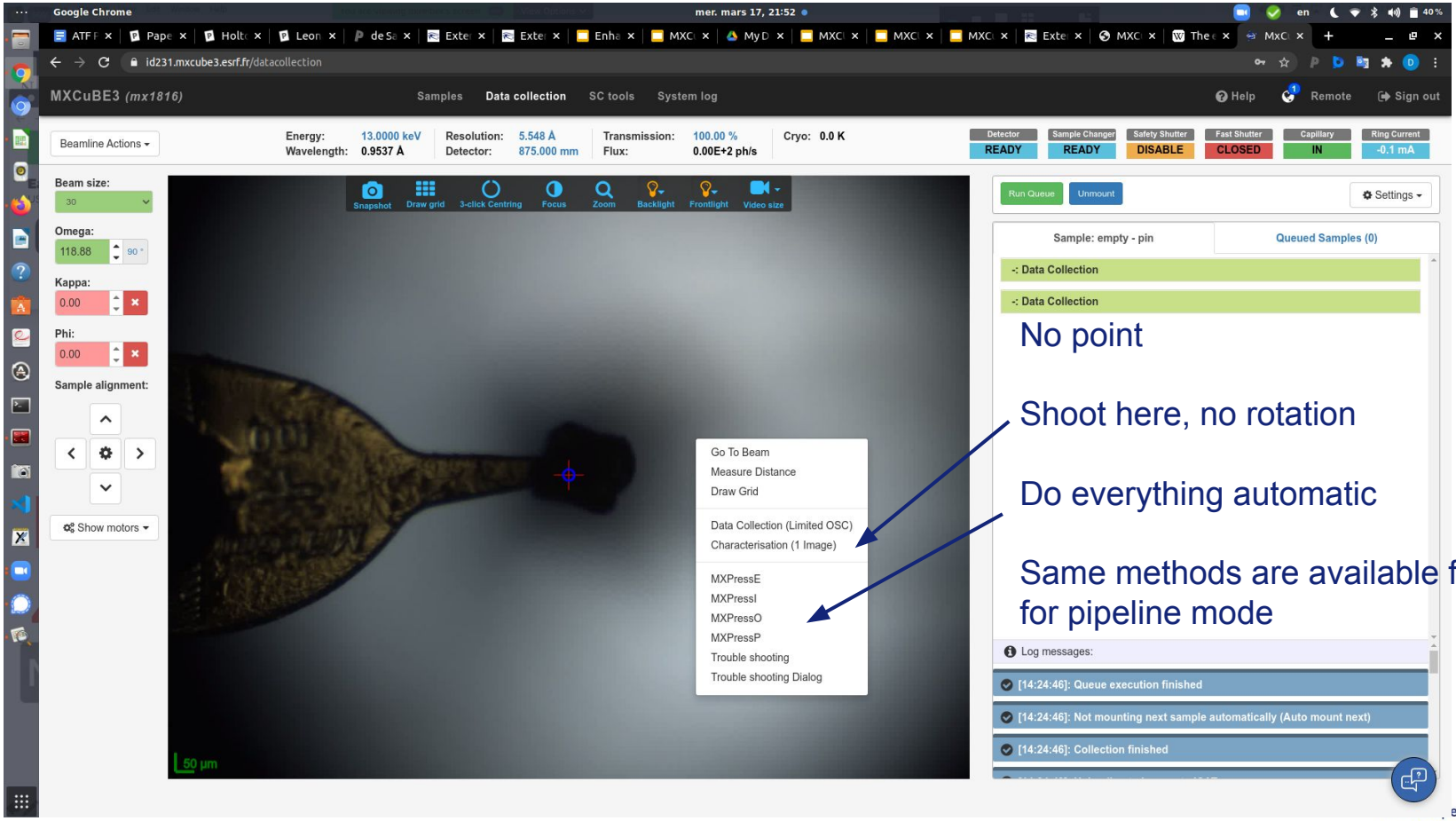
Mesh data collections methods

Mesh&collect
Mesh
X-ray centring

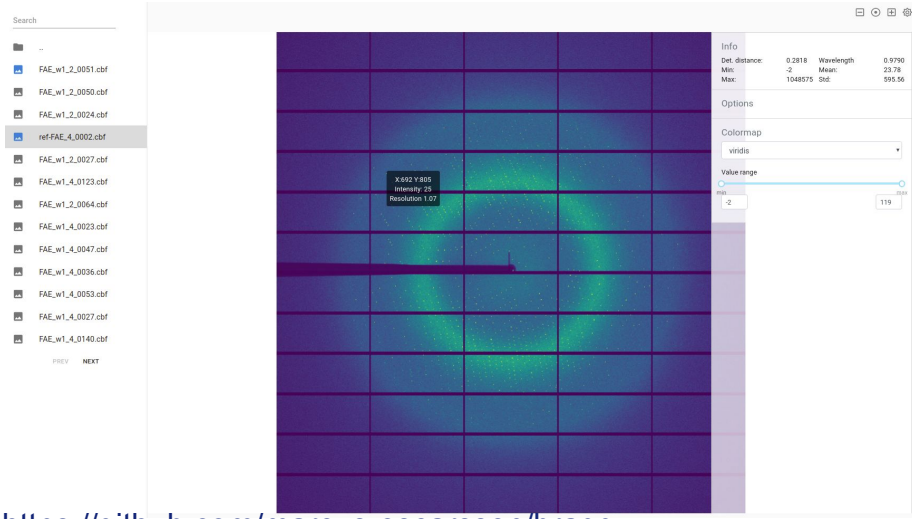
X-RAY CENTRING



Successful X-ray centring generate a new centered point

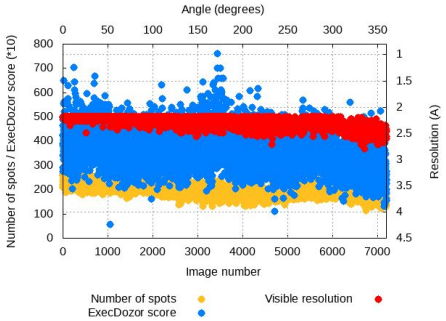

MXCuBE3 (mx1816)
Samples
Data collection
SC tools
System log
Help
Remote
Sign out
Beamline Actions
Energy: 13.0000 keV
Wavelength: 0.9537 Å
Resolution: 5.548 Å
Detector: 875.000 mm
Transmission: 100.00 %
Flux: 0.00E+2 ph/s
Cryo: 0.0 K
Detector READY
Sample Changer READY
Safety Shutter DISABLE
Fast Shutter CLOSED
Capillary IN
Ring Current -0.1 mA
Beam size:
Omega:
Kappa:
Phi:
Sample alignment:
Show motors
Snapshot
Draw grid
3-click Centring
Focus
Zoom
Backlight
Frontlight
Video size
Go To Beam
Measure Distance
Draw Grid
Data Collection (Limited OSC)
Characterisation (1 Image)
MXPressE
MXPressI
MXPressO
MXPressP
Trouble shooting
Trouble shooting Dialog
50 µm
Run Queue
Unmount
Settings
Sample: empty - pin
Queued Samples (0)
-: Data Collection
-: Data Collection
No point
Shoot here, no rotation
Do everything automatic
Same methods are available from Samples for pipeline mode
Log messages:
[14:24:46]: Queue execution finished
[14:24:46]: Not mounting next sample automatically (Auto mount next)
[14:24:46]: Collection finished

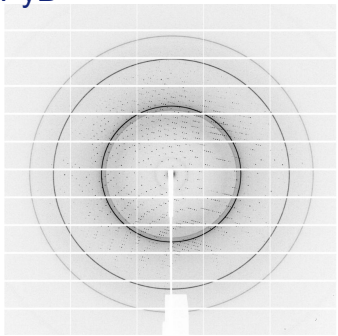
FUTURE PLANS



https://github.com/marcus-oscarsson/braggy

Dozor score and png available in ISPyB

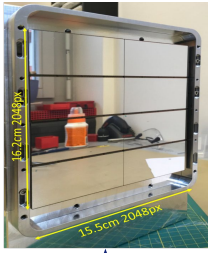


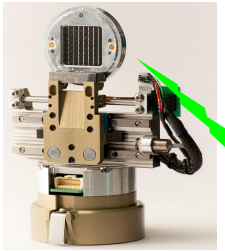


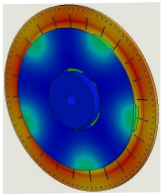
- Integrate a new Web based diffraction image viewer
- Continue the improvement in the ergonomics
- Improve Samples list visualisation and results
- Complete implementation of DozorM and MeshBest combined with mesh results
- Port GP workflows to MXCuBE3
- Finalise integration of crystallisation plate screening
- Implement novel SSX data collection methods
- Controller for “liquid” based delivery systems, pumping, mixing
- Fixed targets, new type of mesh on periodic supports

ID29

RF





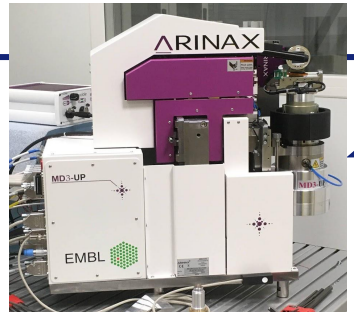


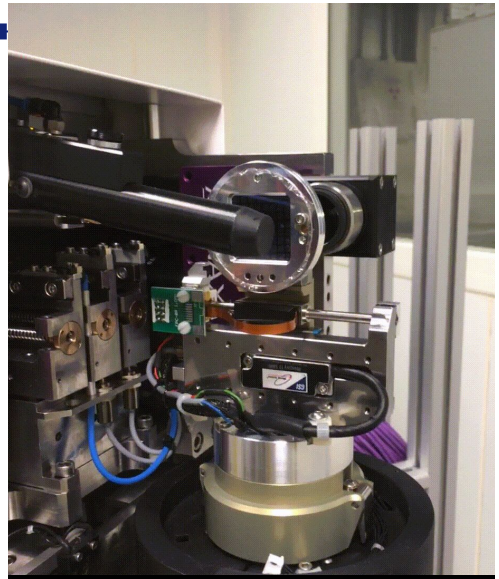
Auxiliary Outputs

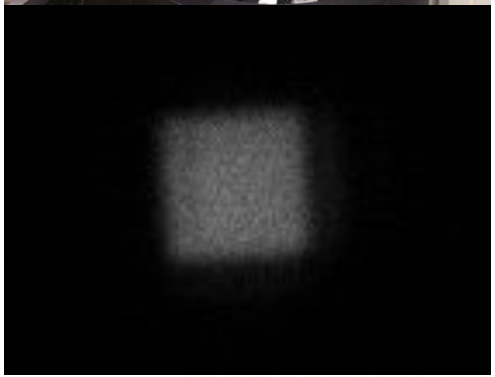
Detector

GPIO

Shutter







Develop a graphical interface for timing mode:

- Defines trigger, offsets and delays
- Be able to retrieve the signals (oscilloscope mode) to monitor the events

X-ray
Trigger 1
Trigger 2

ESRF Electronic Unit
EMBL Instrumentation Team

Opening for PostDoc for ID29
https://www.esrf.eu/Jobs

CONCLUSIONS

- MXCuBE is part of a large collaboration
  - on a common control layer and user interface
  - That makes a great effort in sharing generic components that are commonly used (ex. Detectors, Diffractometers)
  - “Standardisation” is part of a iterative process, continue refactoring
- MXCuBE3 is the web front end
  - Specifically optimised for remote access
  - Facilitate all kind of MX related experiments by hiding the complexity (not removing it)
  - From user perspective it has a flat learning curve
- The home of MXCuBE is https://github.com/mxcube
- The MXCuBE meeting are usually opened to observers, feel free to contact if interested

ACKNOWLEDGEMENTS

ESRF - EMBL Joint Structural Biology Group

The MXCuBE collaboration

http://mxcube.github.io/mxcube/

ESRF - Marcus Oscarsson, Antonia Beteva

MAXIV

EMBL

Global Phasing

SOLEIL

BESSY HZB

ALBA

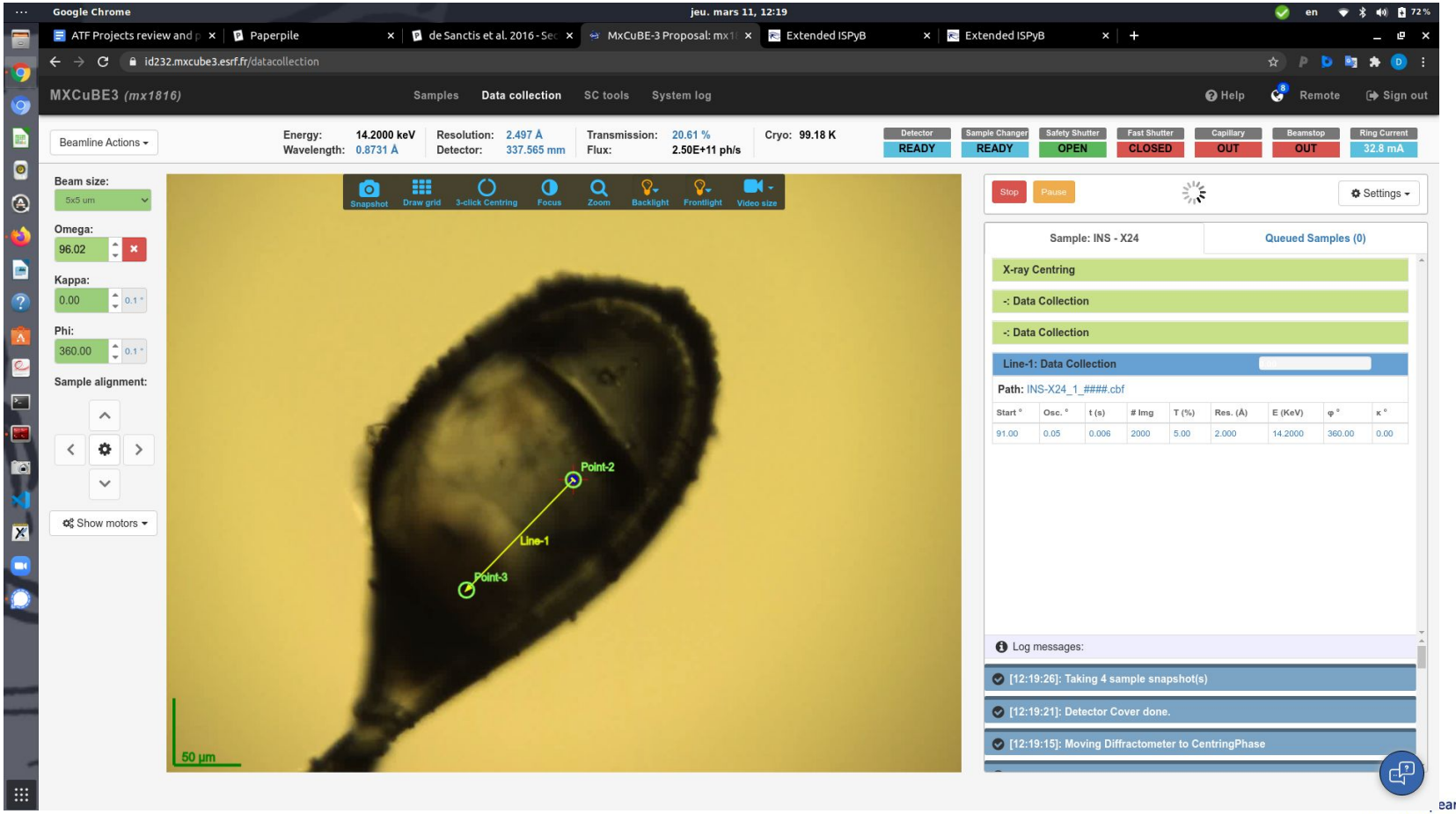
DESY

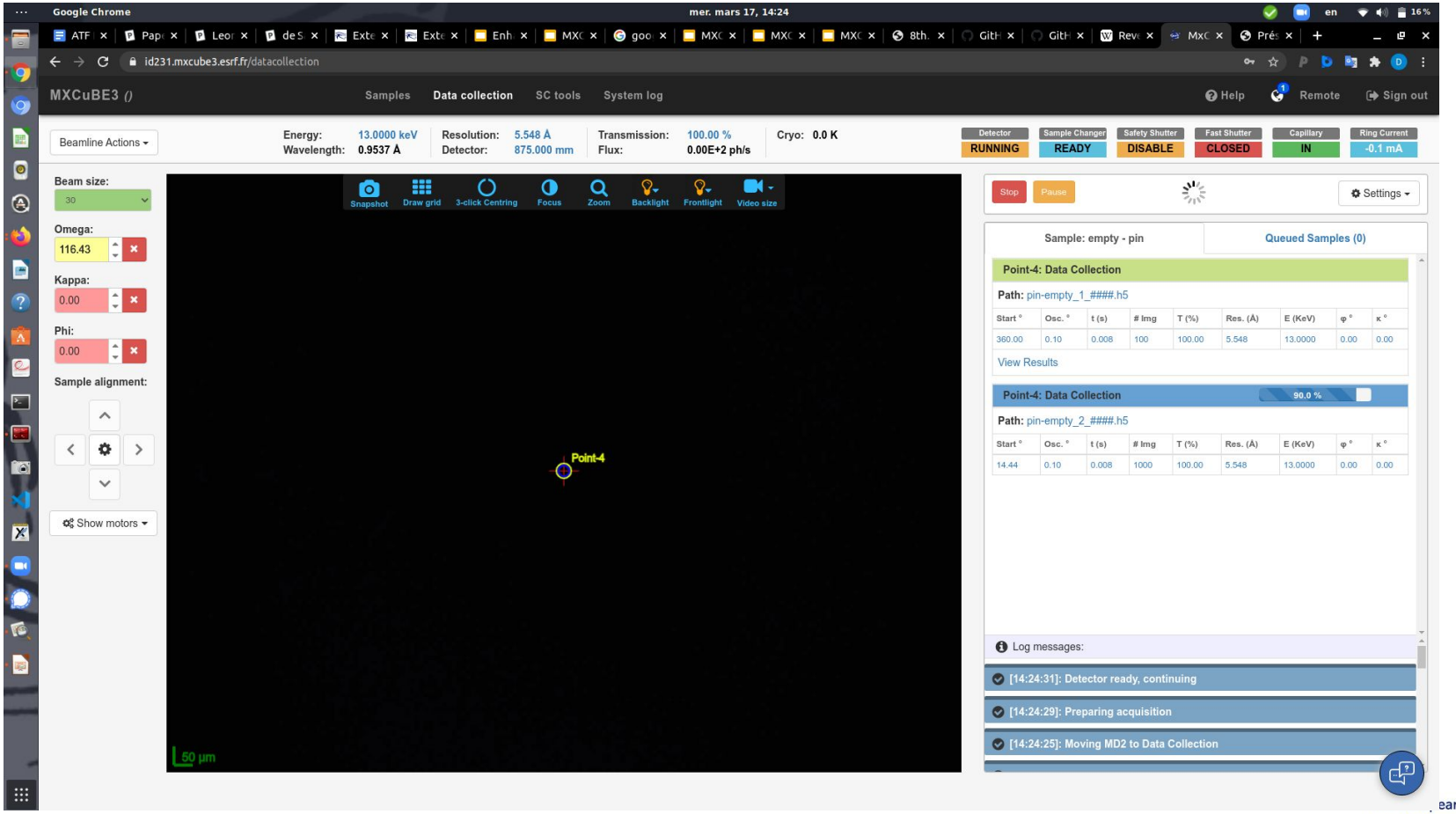
ELETTRA

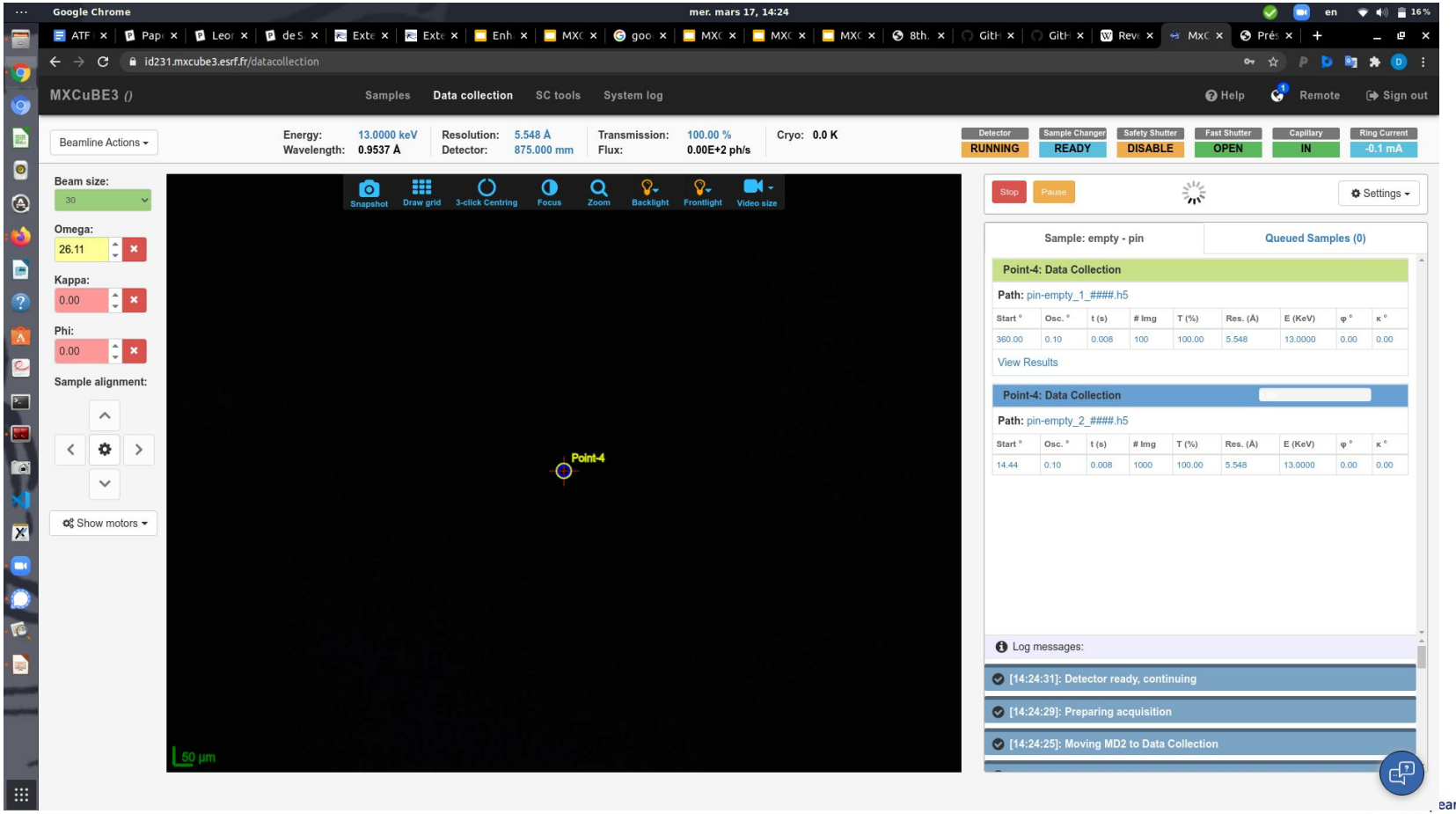
LNLS

NSRRC

EXTRA SLIDES


Google Chrome
jeu. mars 11, 12:19
ATF Projects review and p
Paperpile
de Sanctis et al. 2016 - Sec
MxCuBE-3 Proposal: mx1
Extended ISPyB
Extended ISPyB
id232.mxcube3.esrf.fr/datacollection
MXCuBE3 (mx1816)
Samples
Data collection
SC tools
System log
Help
Remote
Sign out
Beamline Actions
Energy: 14.2000 keV
Wavelength: 0.8731 Å
Resolution: 2.497 Å
Detector: 337.565 mm
Transmission: 20.61 %
Flux: 2.50E+11 ph/s
Cryo: 99.18 K
Detector READY
Sample Changer READY
Safety Shutter OPEN
Fast Shutter CLOSED
Capillary OUT
Beamstop OUT
Ring Current 32.8 mA
Beam size:
5x5 um
Omega:
96.02
Kappa:
0.00
Phi:
360.00
Sample alignment:
Show motors
Snapshot
Draw grid
3-click Centring
Focus
Zoom
Backlight
Frontlight
Video size
Point-2
Line-1
Point-3
50 µm
Stop
Pause
Settings
Sample: INS - X24
Queued Samples (0)
X-ray Centring
-: Data Collection
-: Data Collection
Line-1: Data Collection
Path: INS-X24_1_####.cbf
Start ° | Osc. ° | t (s) | # Img | T (%) | Res. (Å) | E (KeV) | φ ° | κ °
91.00 | 0.05 | 0.006 | 2000 | 5.00 | 2.000 | 14.2000 | 360.00 | 0.00
Log messages:
[12:19:26]: Taking 4 sample snapshot(s)
[12:19:21]: Detector Cover done.
[12:19:15]: Moving Diffractometer to CentringPhase


Google Chrome
mer. mars 17, 14:24
id231.mxcube3.esrf.fr/datacollection
MXCuBE3
Samples
Data collection
SC tools
System log
Help
Remote
Sign out
Beamline Actions
Energy: 13.0000 keV
Wavelength: 0.9537 Å
Resolution: 5.548 Å
Detector: 875.000 mm
Transmission: 100.00 %
Flux: 0.00E+2 ph/s
Cryo: 0.0 K
Detector RUNNING
Sample Changer READY
Safety Shutter DISABLE
Fast Shutter CLOSED
Capillary IN
Ring Current -0.1 mA
Beam size:
30
Omega:
116.43
Kappa:
0.00
Phi:
0.00
Sample alignment:
Show motors
Snapshot
Draw grid
3-click Centring
Focus
Zoom
Backlight
Frontlight
Video size
Point-4
50 µm
Stop
Pause
Settings
Sample: empty - pin
Queued Samples (0)
Point-4: Data Collection
Path: pin-empty_1_####.h5
Start ° Osc. ° t (s) # Img T (%) Res. (Å) E (KeV) φ ° κ °
360.00 0.10 0.008 100 100.00 5.548 13.0000 0.00 0.00
View Results
Point-4: Data Collection
90.0 %
Path: pin-empty_2_####.h5
Start ° Osc. ° t (s) # Img T (%) Res. (Å) E (KeV) φ ° κ °
14.44 0.10 0.008 1000 100.00 5.548 13.0000 0.00 0.00
Log messages:
[14:24:31]: Detector ready, continuing
[14:24:29]: Preparing acquisition
[14:24:25]: Moving MD2 to Data Collection


Google Chrome
mer. mars 17, 14:24
id231.mxcube3.esrf.fr/datacollection
MXCuBE3
Samples
Data collection
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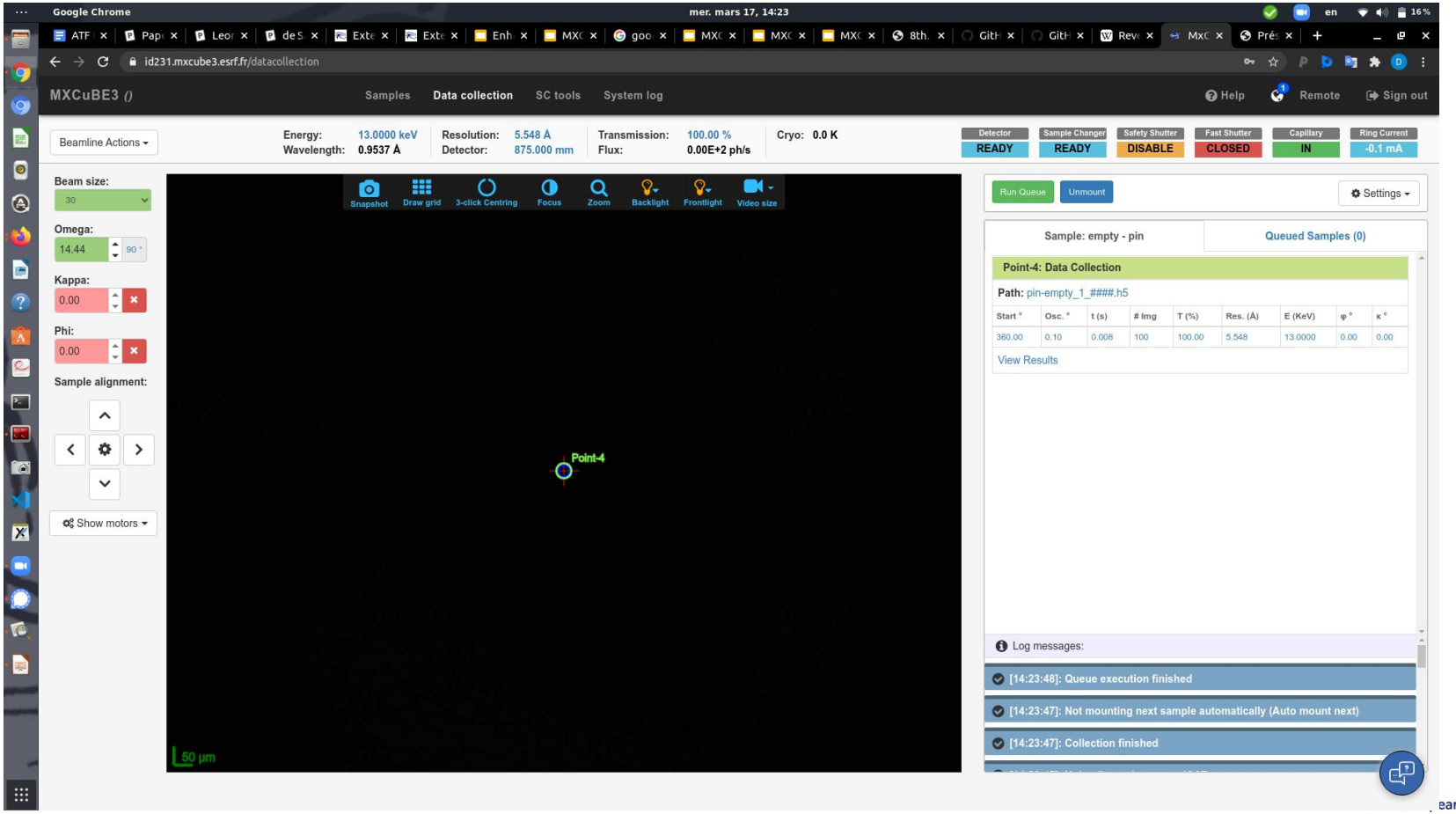
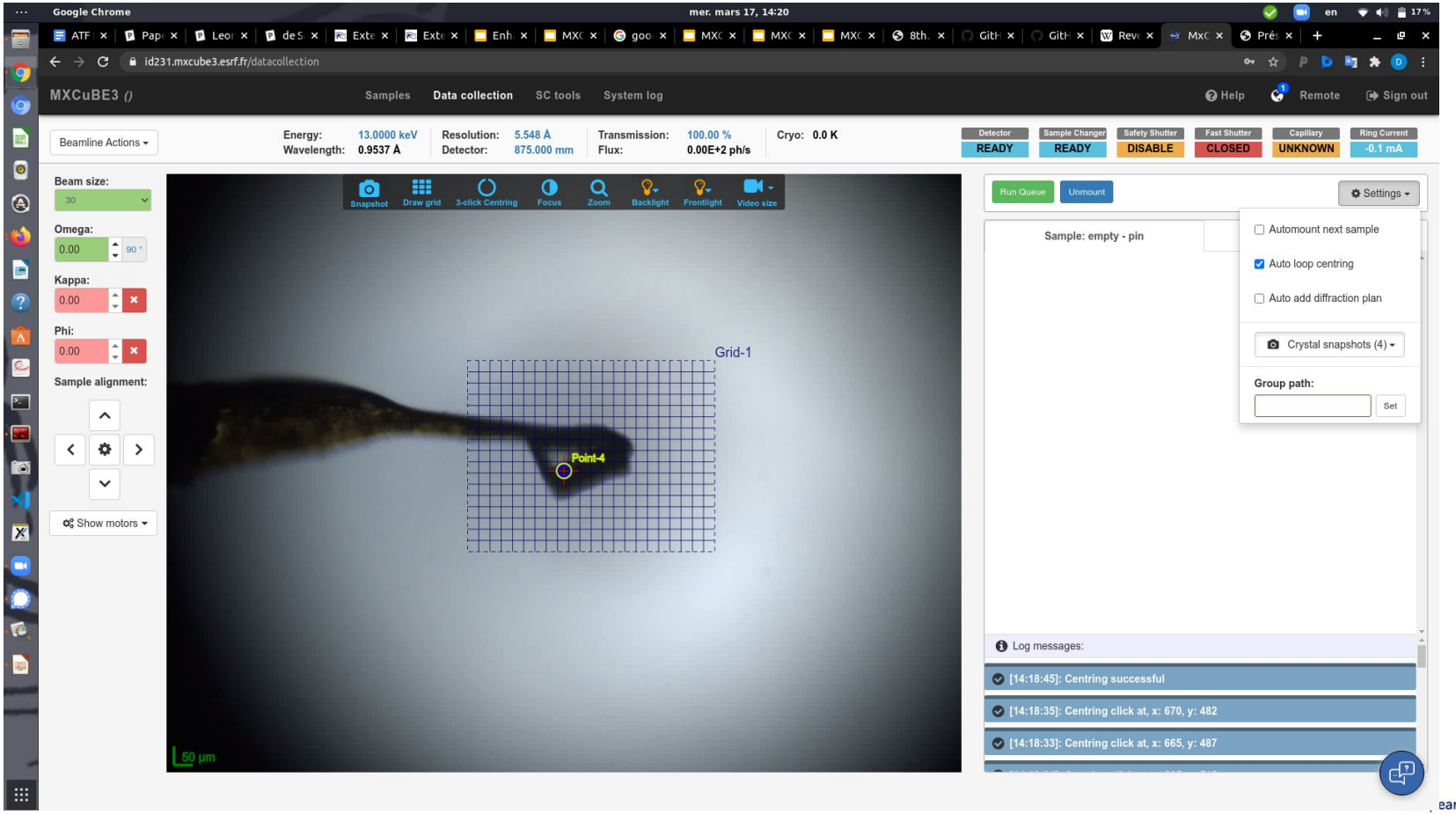
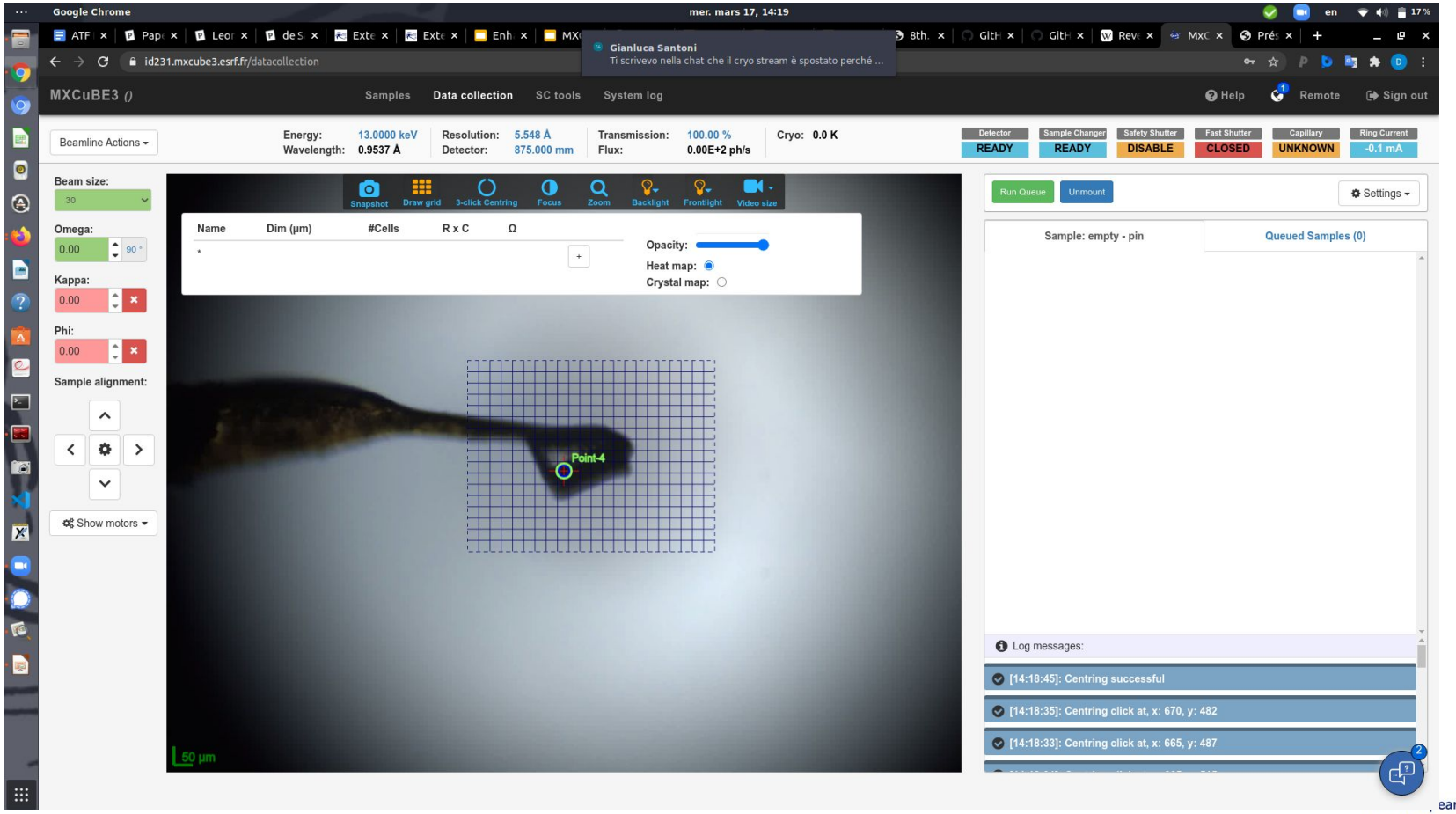
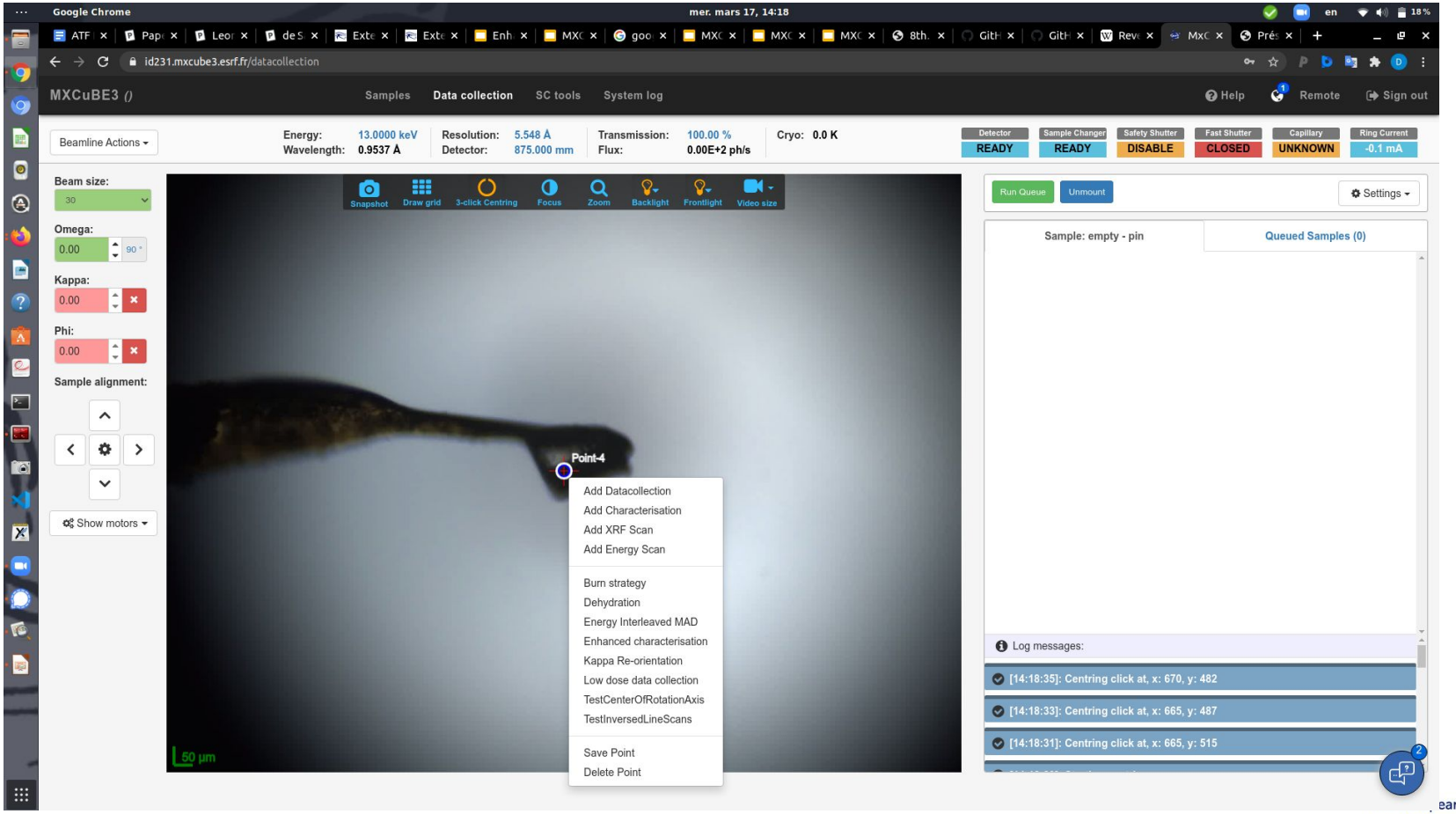
System log
Help
Remote
Sign out
Beamline Actions
Energy: 13.0000 keV
Wavelength: 0.9537 Å
Resolution: 5.548 Å
Detector: 875.000 mm
Transmission: 100.00 %
Flux: 0.00E+2 ph/s
Cryo: 0.0 K
Detector RUNNING
Sample Changer READY
Safety Shutter DISABLE
Fast Shutter OPEN
Capillary IN
Ring Current -0.1 mA
Beam size:
Omega:
26.11
Kappa:
0.00
Phi:
0.00
Sample alignment:
Show motors
Snapshot
Draw grid
3-click Centring
Focus
Zoom
Backlight
Frontlight
Video size
Point-4
50 µm
Stop
Pause
Settings
Sample: empty - pin
Queued Samples (0)
Point-4: Data Collection
Path: pin-empty_1_####.h5
Start ° | Osc. ° | t (s) | # Img | T (%) | Res. (Å) | E (KeV) | φ ° | κ °
360.00 | 0.10 | 0.008 | 100 | 100.00 | 5.548 | 13.0000 | 0.00 | 0.00
View Results
Point-4: Data Collection
Path: pin-empty_2_####.h5
Start ° | Osc. ° | t (s) | # Img | T (%) | Res. (Å) | E (KeV) | φ ° | κ °
14.44 | 0.10 | 0.008 | 1000 | 100.00 | 5.548 | 13.0000 | 0.00 | 0.00
Log messages:
[14:24:31]: Detector ready, continuing
[14:24:29]: Preparing acquisition
[14:24:25]: Moving MD2 to Data Collection

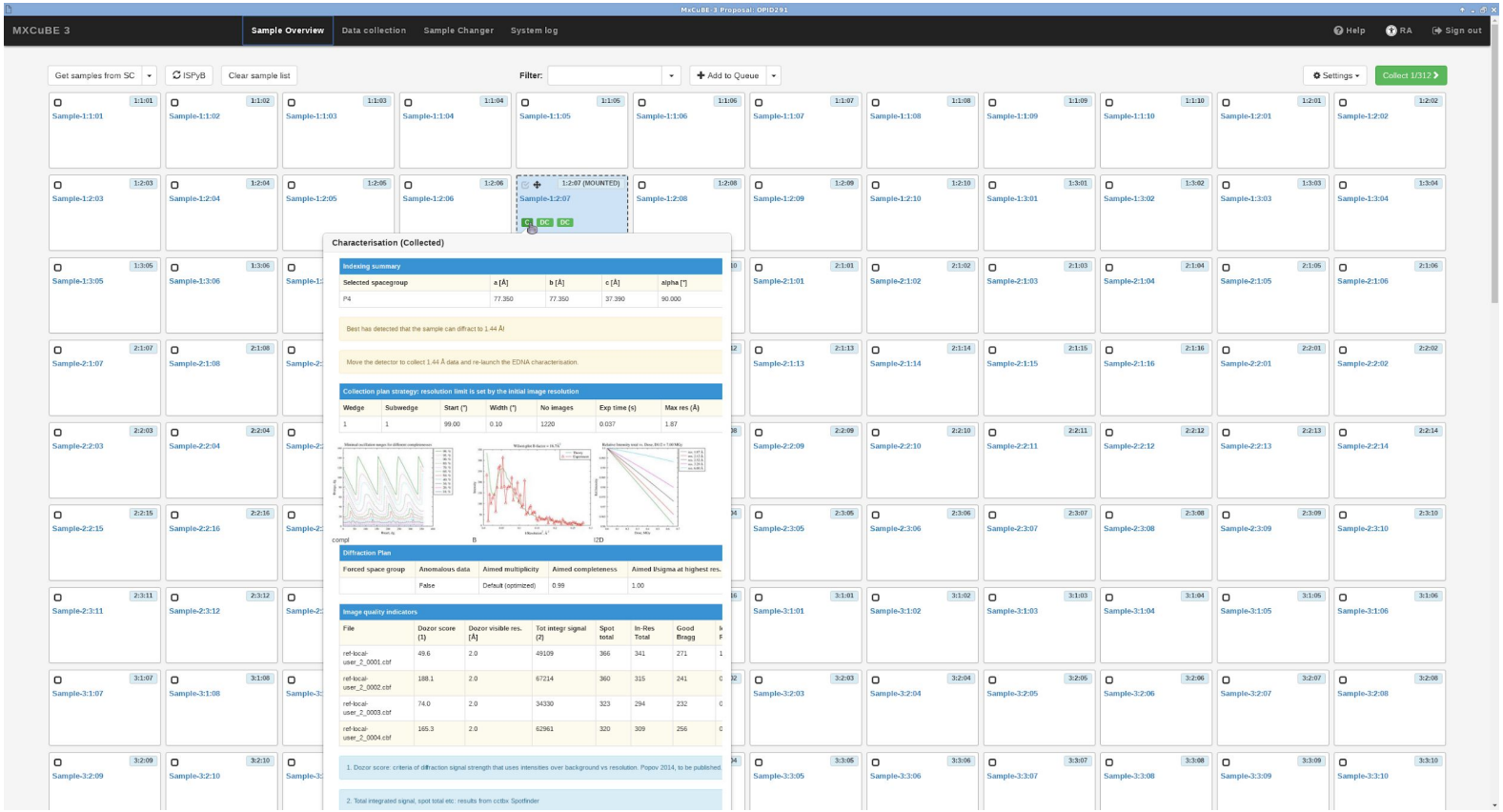

Google Chrome
mer. mars 17, 14:23
id231.mxcube3.esrf.fr/datacollection
MXCuBE3
Samples
Data collection
SC tools
System log
Help
Remote
Sign out
Beamline Actions
Energy: 13.0000 keV
Wavelength: 0.9537 Å
Resolution: 5.548 Å
Detector: 875.000 mm
Transmission: 100.00 %
Flux: 0.00E+2 ph/s
Cryo: 0.0 K
Detector READY
Sample Changer READY
Safety Shutter DISABLE
Fast Shutter CLOSED
Capillary IN
Ring Current -0.1 mA
Beam size:
Omega:
Kappa:
Phi:
Sample alignment:
Show motors
Snapshot
Draw grid
3-click Centring
Focus
Zoom
Backlight
Frontlight
Video size
Point-4
50 µm
Run Queue
Unmount
Settings
Sample: empty - pin
Queued Samples (0)
Point-4: Data Collection
Path: pin-empty_1_####.h5
Start ° | Osc. ° | t (s) | # Img | T (%) | Res. (Å) | E (KeV) | φ ° | κ °
360.00 | 0.10 | 0.008 | 100 | 100.00 | 5.548 | 13.0000 | 0.00 | 0.00
View Results
Log messages:
[14:23:48]: Queue execution finished
[14:23:47]: Not mounting next sample automatically (Auto mount next)
[14:23:47]: Collection finished


Google Chrome
mer. mars 17, 14:20
id231.mxcube3.esrf.fr/datacollection
MXCuBE3
Samples
Data collection
SC tools
System log
Help
Remote
Sign out
Beamline Actions
Energy: 13.0000 keV
Wavelength: 0.9537 Å
Resolution: 5.548 Å
Detector: 875.000 mm
Transmission: 100.00 %
Flux: 0.00E+2 ph/s
Cryo: 0.0 K
Detector READY
Sample Changer READY
Safety Shutter DISABLE
Fast Shutter CLOSED
Capillary UNKNOWN
Ring Current -0.1 mA
Beam size:
Omega:
Kappa:
Phi:
Sample alignment:
Show motors
Snapshot
Draw grid
3-click Centring
Focus
Zoom
Backlight
Frontlight
Video size
Grid-1
Point-4
50 µm
Run Queue
Unmount
Settings
Sample: empty - pin
Automount next sample
Auto loop centring
Auto add diffraction plan
Crystal snapshots (4)
Group path:
Set
Log messages:
[14:18:45]: Centring successful
[14:18:35]: Centring click at, x: 670, y: 482
[14:18:33]: Centring click at, x: 665, y: 487

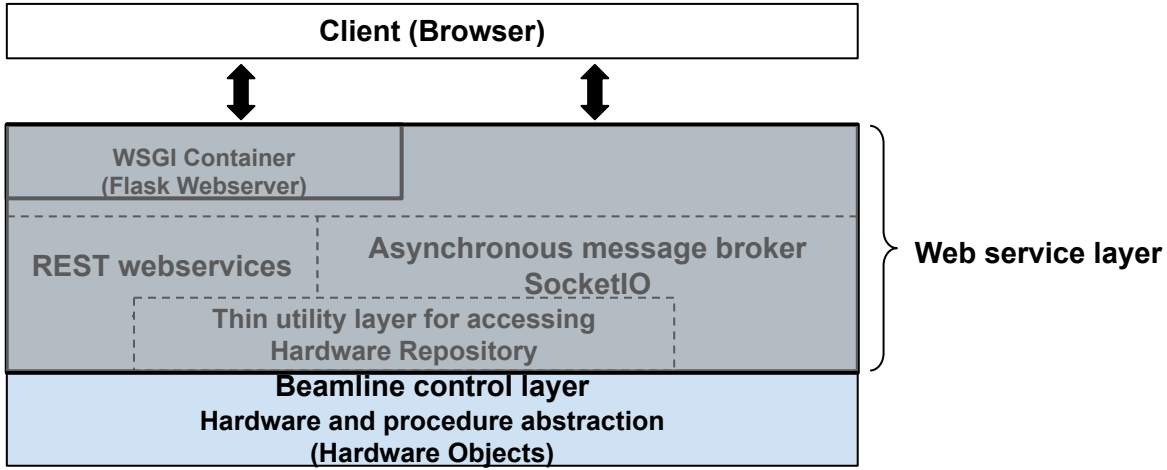

Google Chrome
mer. mars 17, 14:19
Gianluca Santoni
Ti scrivevo nella chat che il cryo stream è spostato perché ...
id231.mxcube3.esrf.fr/datacollection
MXCuBE3
Samples
Data collection
SC tools
System log
Help
Remote
Sign out
Beamline Actions
Energy: 13.0000 keV
Wavelength: 0.9537 Å
Resolution: 5.548 Å
Detector: 875.000 mm
Transmission: 100.00 %
Flux: 0.00E+2 ph/s
Cryo: 0.0 K
Detector READY
Sample Changer READY
Safety Shutter DISABLE
Fast Shutter CLOSED
Capillary UNKNOWN
Ring Current -0.1 mA
Beam size:
Omega:
Kappa:
Phi:
Sample alignment:
Show motors
Snapshot
Draw grid
3-click Centring
Focus
Zoom
Backlight
Frontlight
Video size
Name
Dim (µm)
#Cells
R x C
Ω
Opacity:
Heat map:
Crystal map:
Point-4
50 µm
Run Queue
Unmount
Settings
Sample: empty - pin
Queued Samples (0)
Log messages:
[14:18:45]: Centring successful
[14:18:35]: Centring click at, x: 670, y: 482
[14:18:33]: Centring click at, x: 665, y: 487


Google Chrome
mer. mars 17, 14:18
id231.mxcube3.esrf.fr/datacollection
MXCuBE3
Samples
Data collection
SC tools
System log
Help
Remote
Sign out
Beamline Actions
Energy: 13.0000 keV
Wavelength: 0.9537 Å
Resolution: 5.548 Å
Detector: 875.000 mm
Transmission: 100.00 %
Flux: 0.00E+2 ph/s
Cryo: 0.0 K
Detector READY
Sample Changer READY
Safety Shutter DISABLE
Fast Shutter CLOSED
Capillary UNKNOWN
Ring Current -0.1 mA
Beam size:
Omega:
Kappa:
Phi:
Sample alignment:
Show motors
Snapshot
Draw grid
3-click Centring
Focus
Zoom
Backlight
Frontlight
Video size
Point-4
Add Datacollection
Add Characterisation
Add XRF Scan
Add Energy Scan
Burn strategy
Dehydration
Energy Interleaved MAD
Enhanced characterisation
Kappa Re-orientation
Low dose data collection
TestCenterOfRotationAxis
TestInversedLineScans
Save Point
Delete Point
50 µm
Run Queue
Unmount
Settings
Sample: empty - pin
Queued Samples (0)
Log messages:
[14:18:35]: Centring click at, x: 670, y: 482
[14:18:33]: Centring click at, x: 665, y: 487
[14:18:31]: Centring click at, x: 665, y: 515

CHARACTERISATION

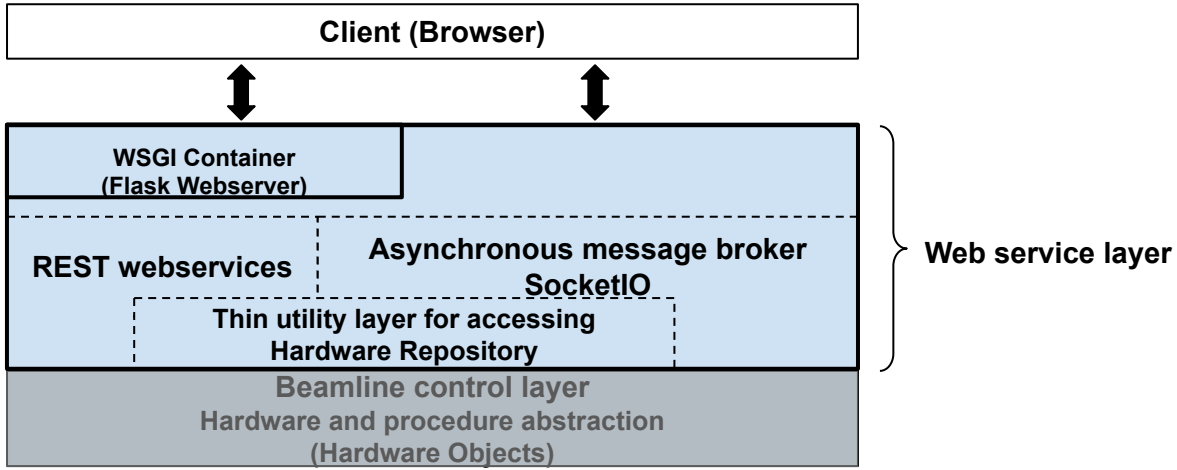


Backend



- Built on top of the same **beamline control layer as MXCuBE 2 (Hardware Objects)**
- Instruments and procedures are implemented as what is called **Hardware Objects**
- The beamline control layer is **control system agnostic** and supports for instance **SPEC, EPICS, Sardana, BLISS and TANGO**
- Base classes define a common API for a particular instrument or procedure, which **facilitates cross site adaptation**

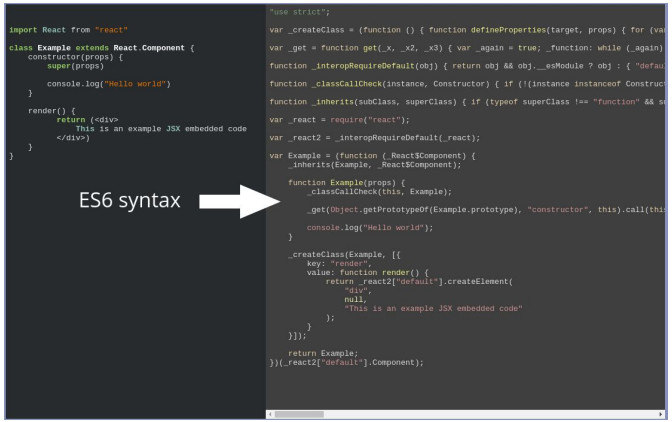
Web Service Layer



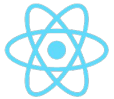
- **Defines an API** for clients to access the HardwareObjects, and relays events between Hardware Objects and clients **(not necessarily a browsers)**
- Thin utility layer for providing new **functionality exclusive to MXCuBE 3** and ease access to Hardware Objects
- Websockets, via SocketIO, **used to relay events from backend**
- Implemented on top of a Flask **web server, WSGI container**

- Application written in HTML 5, Javascript 6 (JS6) and CSS
- JS6 gives us the possibility to use reusable components and modules
- Problem, no browser have full JS6 support

Babel allows us to use reusable modules and classes via ES6 syntax (https://babeljs.io/)



ES6 Code is “transpiled” with babel to ES5 which have good support in most browsers



React

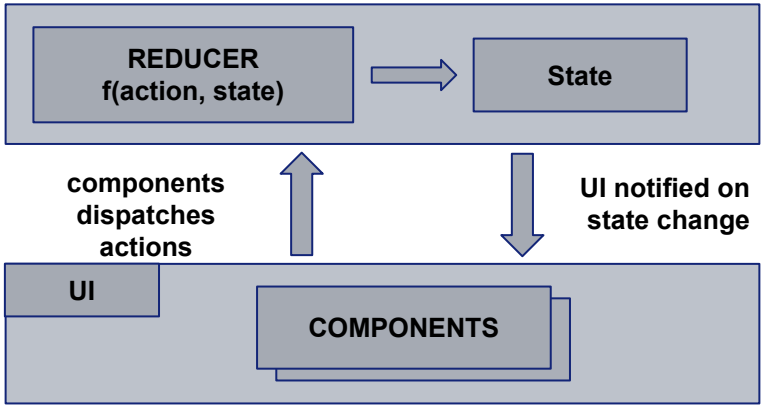
https://facebook.github.io/react/

- React is a library for creating user interfaces
- React makes it possible to use widgets like in traditional UI development
- Provides a way to express the UI in a markup language called JSX
- Can be used with state management library, in order to avoid per widget state

```
import React from "react"

class Example extends React.Component {
    constructor(props) {
        super(props)

        console.log("Hello world")
    }

    render() {
          return (<div>
              This is an example JSX embedded code
          </div>)
    }
}
```

Redux

http://redux.js.org/



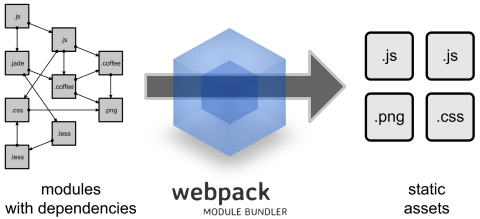
- Application wide state, only source of data for components.
- The redux store is an immutable data structure and can only be updated (replaced) by a pure function, a reducer
- The reducer function is called by dispatching an action for instance when user interacts with UI
- Provides data flow which is easy to debug

Frontend development - React and Redux

```jsx
import React from 'react';
import { Button, ButtonGroup, OverlayTrigger, Popover } from 'react-bootstrap';

import './style.css';
import '../input.css';


export default class InOutSwitch extends React.Component {
  constructor(props) {
    super(props);
    this.setIn = this.setIn.bind(this);
    this.setOut = this.setOut.bind(this);
  }


  shouldComponentUpdate(nextProps) {
    return nextProps.data !== this.props.data;
  }


  setIn() {
    if (this.props.onSave !== undefined) {
      this.props.onSave(this.props.pkey, 'in');
    }
  }


  setOut() {
    if (this.props.onSave !== undefined) {
      this.props.onSave(this.props.pkey, 'out');
    }
  }
```

```jsx
  render() {
    const isIn = this.props.data.state === 'in';
    const inButtonStyle = isIn ? 'success' : 'default';
    const outButtonStyle = isIn ? 'default' : 'success';
    let msgBgStyle = 'input-bg-moving';

    if (this.props.data.state === 'in') {
      msgBgStyle = 'input-bg-ready';
    } else if (this.props.data.state === 'out') {
      msgBgStyle = 'input-bg-fault';
    }


    return (
      <div>
        <div className="inout-label">
          {this.props.labelText}
        </div>
        <OverlayTrigger
          placement="bottom"
          overlay={(<Popover id={this.props.labelText}>
                      {this.props.labelText} is:
                      <div className={`inout-switch-msg ${msgBgStyle}`}>
                        {this.props.data.msg}
                      </div>
                    </Popover>)}
        >
        <ButtonGroup>

          <Button
            className=""
            bsStyle={inButtonStyle}
            bsSize="small"
            onClick={this.setIn}
            active={isIn}
          >
            {this.props.onText}
          </Button>
          <Button
            bsStyle={outButtonStyle}
            bsSize="small"
            className=""
            onClick={this.setOut}
            active={!isIn}
          >
            {this.props.offText}
          </Button>
        </ButtonGroup>
        </OverlayTrigger>
      </div>
    );
  }
}
```

```jsx
  createActuatorComponent() {
    const acts = [];
    for (let key in this.props.data.attributes) {
      if (this.props.data.attributes[key].type === 'DUOSTATE') {
        acts.push(<Col key={key} sm={1} smPush={2}>
                    <InOutSwitch
                      onText={ this.props.data.attributes[key].commands[0] }
                      offText={ this.props.data.attributes[key].commands[1] }
                      labelText={ this.props.data.attributes[key].label }
                      pkey={ key }
                      data={ this.props.data.attributes[key] }
                      onSave={ this.setAttribute }
                    />
                  </Col>
                );
      }
    }
    return acts;
```



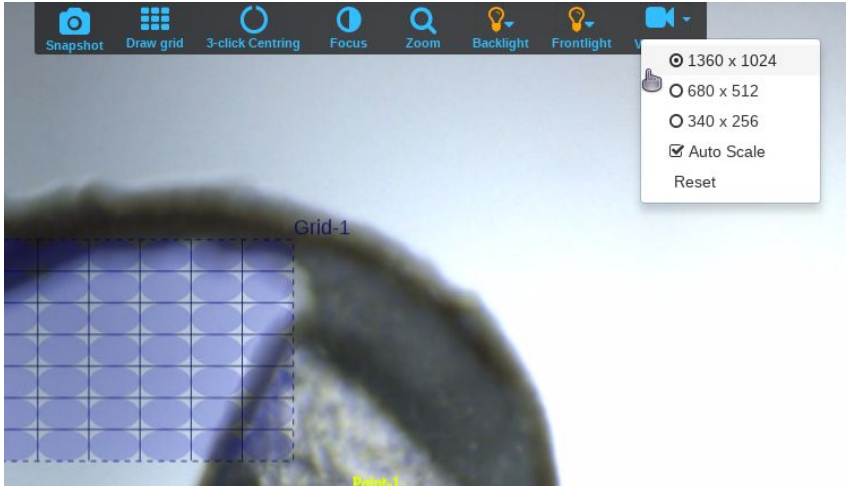
- **Webpack is used as a build tool to bundle the various assets, JS, CSS, LESS, Fonts and images to a set of static files that can be loaded by the browser.**

webpack

webpack Dev Server

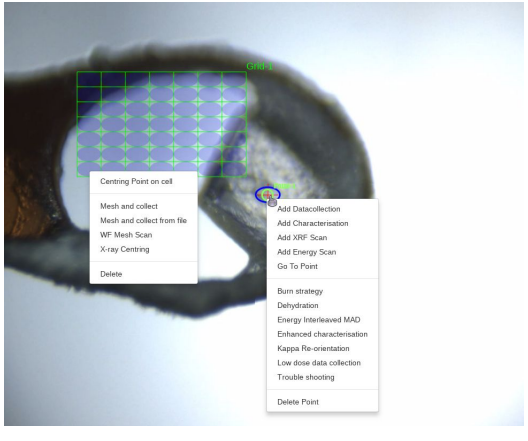
- **Provides a development server with “hot reloading” (changes are automatically built and app updated)**

- **Runtime for Javascript development provided by node.js**



- **Video is streamed as MPEG-1, perhaps adaptive MPEG-4 in the future**
- **Possibility to select video stream size (particularly useful for remote users)**
- **With auto scale option**

Context based navigation, options depends on selection




diamond
ESRF
PSI
DESY
ANKA
SOLEIL
HZB
Helmholtz Zentrum Berlin
MAX-lab
CHESS
GΦL
Canadian Light Source
Centre canadien de rayonnement synchrotron
ALBA
elettra
CANDLE
IHEP
PF
Argonne
ALS
SPring-8
PAL
nsls
SSRL
NSLSII
SINAP
NSRRC
Australian Synchrotron
SESAME
Siam Photon
NUS
LNLS


diamond
ESRF
SOLEIL
CHESS
GΦL
HZB Helmholtz Zentrum Berlin
MAX-lab
Canadian Light Source
Centre canadien de rayonnement synchrotron
ALBA
elettra
CANDLE
IHEP
Argonne
ALS
SSRL
nsls
NSLSII
PF
SPring-8
PAL
SINAP
NSRRC
Australian Synchrotron
LNLS
SESAME
Siam Photon
NUS


diamond
ESRF
SOLEIL
SYNCHROTRON
DESY
HZB
Helmholtz
Zentrum Berlin
MAX-lab
GΦL
CHESS
Canadian
Light
Source
Centre canadien
de rayonnement
synchrotron
ALBA
elettra
CANDLE
IHEP
Argonne
NATIONAL LABORATORY
ALS
PF
SPring-8
PAL
nsls
SSRL
NSLSII
SINAP
NSRRC
Australian
Synchrotron
LNLS
SESAME
Siam Photon
NUS


diamond
ESRF
SOLEIL
DESY
HZB Helmholtz Zentrum Berlin
MAX-lab
GΦL
elettra
ALBA
CHESS
Canadian Light Source
Centre canadien de rayonnement synchrotron
IHEP
CANDLE
Argonne
ALS
SSRL
nsls
NSLSII
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SPring-8
PAL
SINAP
NSRRC
Australian Synchrotron
LNLS
SESAME
NUS