SOLARIS
NATIONAL SYNCHROTRON
RADIATION CENTRE

JAGIELLONIAN UNIVERSITY
IN KRAKOW

JAGIELLONIAN UNIVERSITY IN KRAKOW

SOLARIS
NATIONAL SYNCHROTRON RADIATION CENTRE

Status Report

Lukasz Zytniak on behalf of CSiIT group and whole the Solaris Team
Hamburg, 6-10-2015
DESY

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Outline

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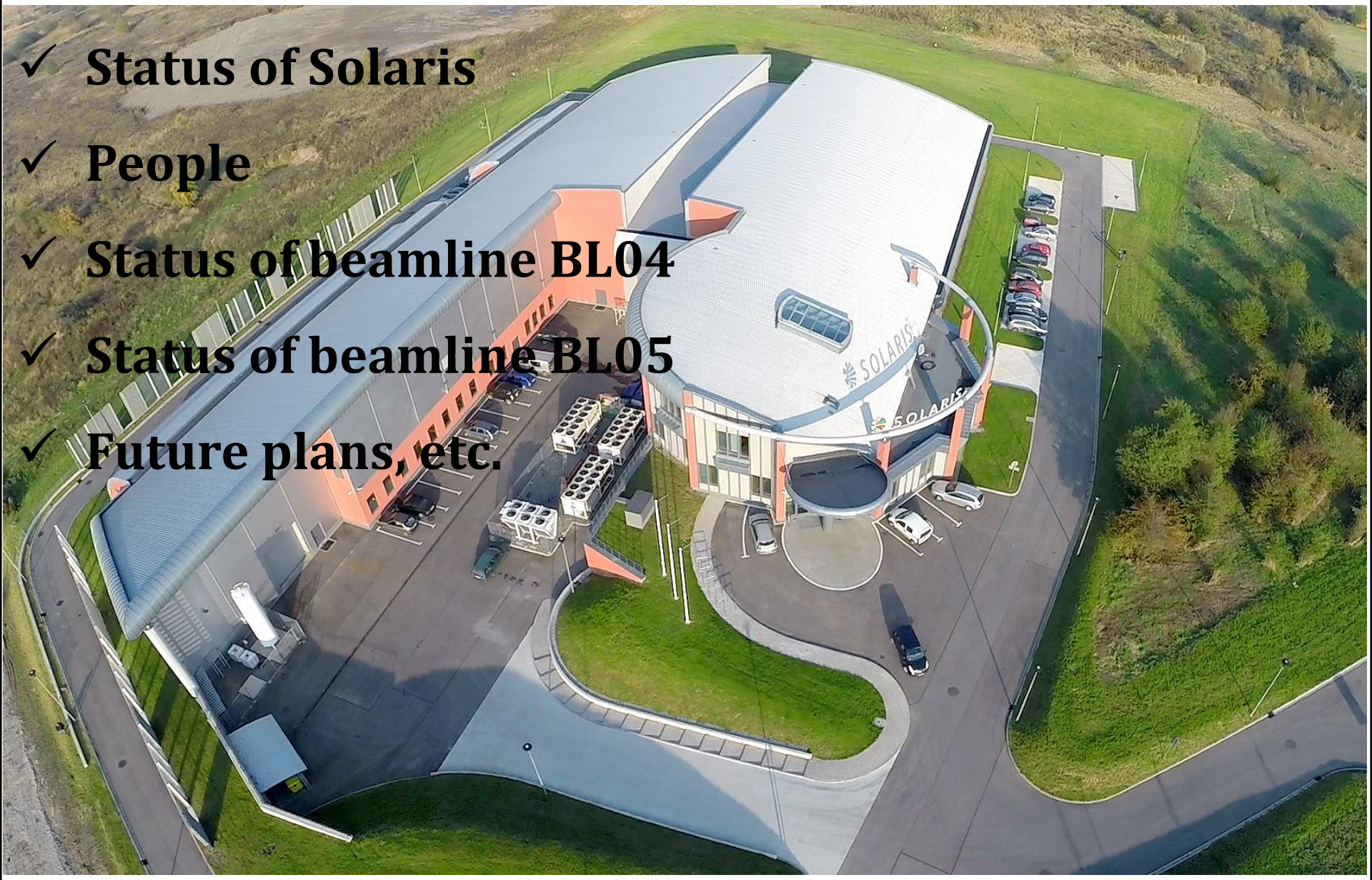


- ✓ Status of Solaris
- ✓ People
- ✓ Status of beamline BL04
- ✓ Status of beamline BL05
- ✓ Future plans, etc.

Time Schedule

April 2010 – project start

January 2012 – start of the building construction

May 2014 – building handover

June 2014 machine installation

November 2014 linac conditioning start

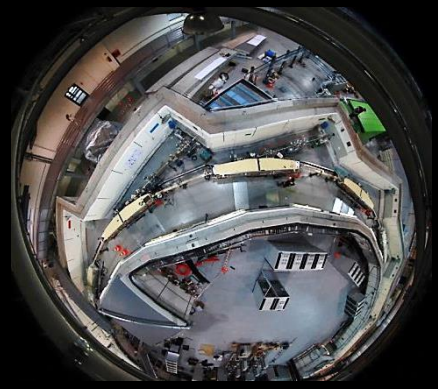
April 2015 Storage ring installation done

May 2015 Solaris commissioning start

19th June 2015 first light observed in Solaris

1st of October 2015 1,5GeV

December 2015 end of the project



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Machine Parameters

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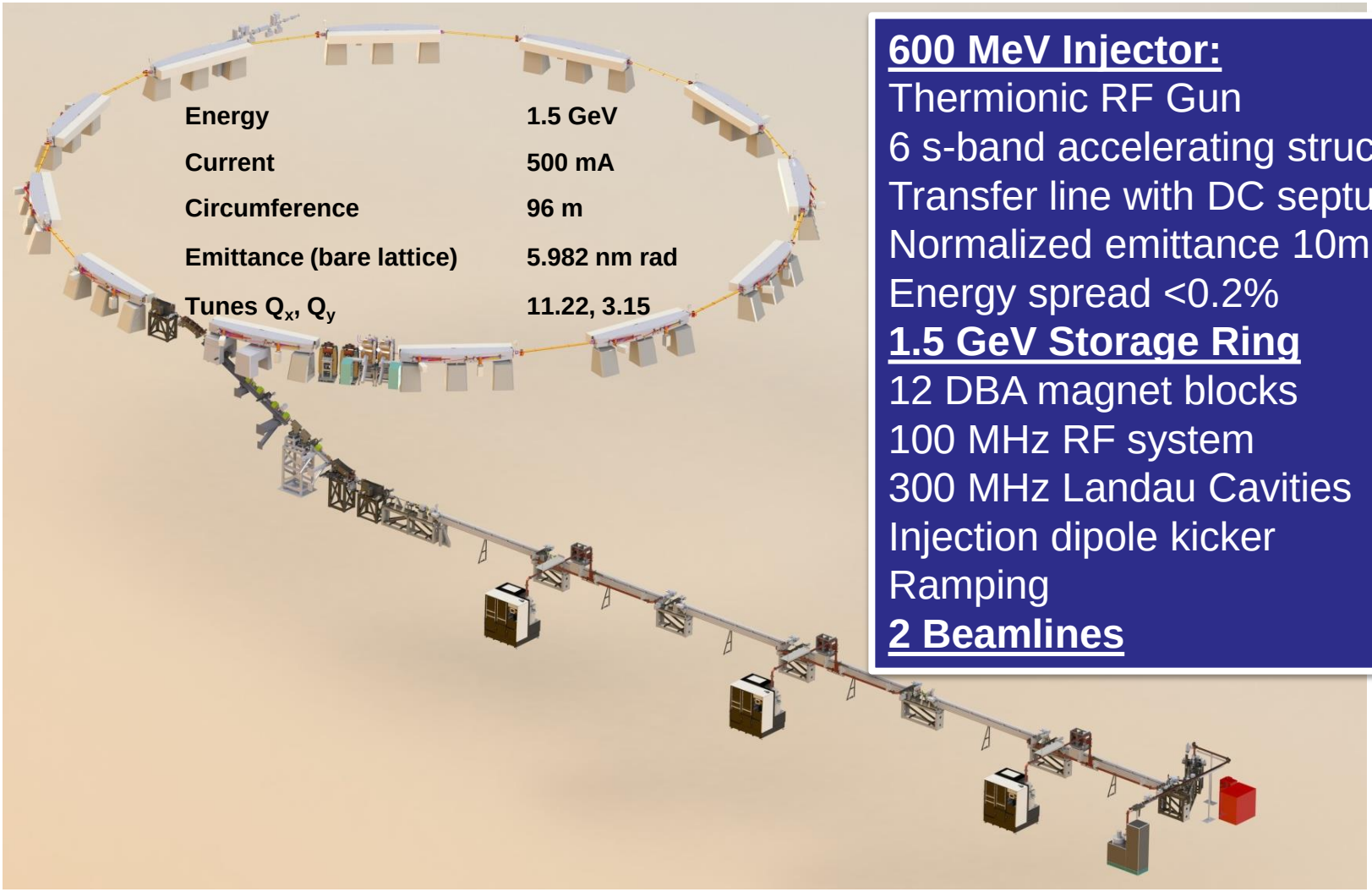

600 MeV Injector:

Thermionic RF Gun

6 s-band accelerating structures

Transfer line with DC septum

Normalized emittance 10mm mrad

Energy spread <0.2%

1.5 GeV Storage Ring

12 DBA magnet blocks

100 MHz RF system

300 MHz Landau Cavities

Injection dipole kicker

Ramping

2 Beamlines

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First electrons @ Solaris

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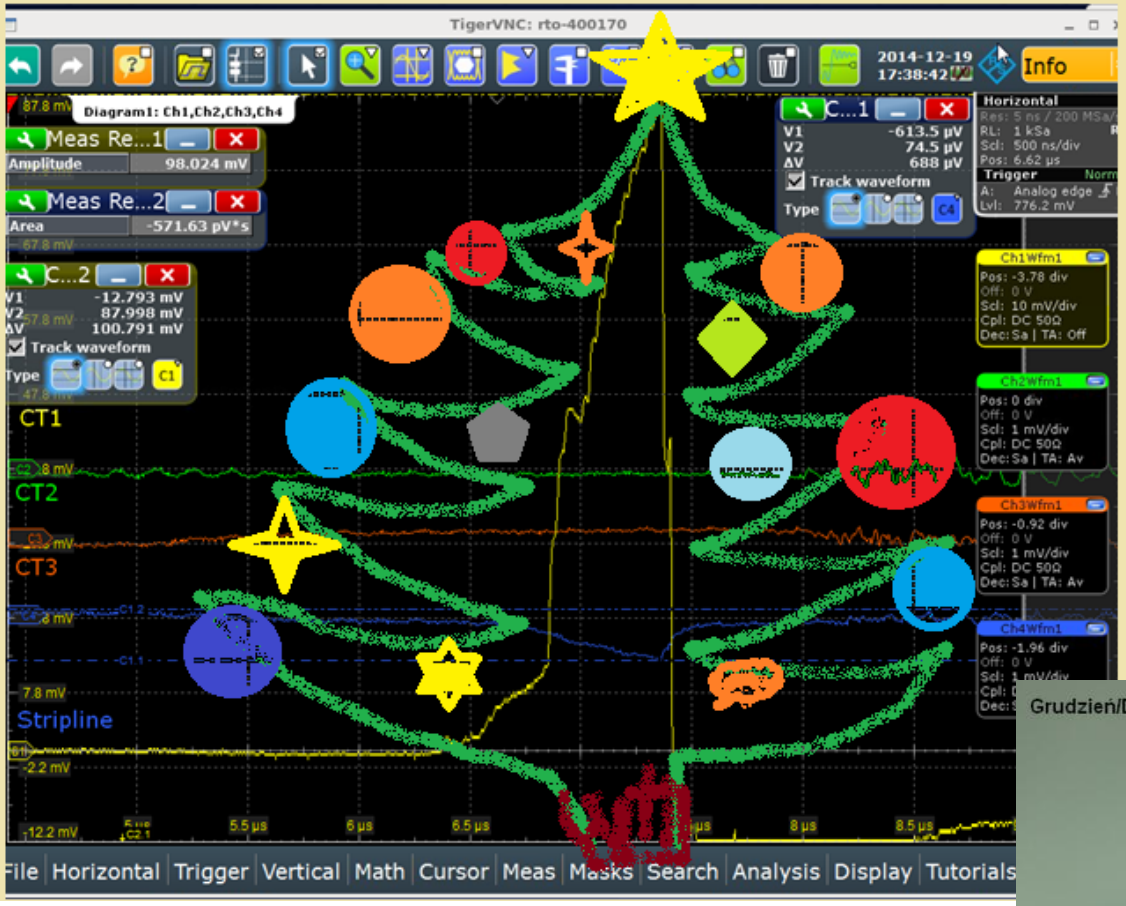

19.12.2014

First electrons from SOLARIS RF GUN

RF Power Forward to the gun= 0.86MW

Electron current = 100mA

Merry Christmas and a Happy New Year

First beam in Solaris storage ring

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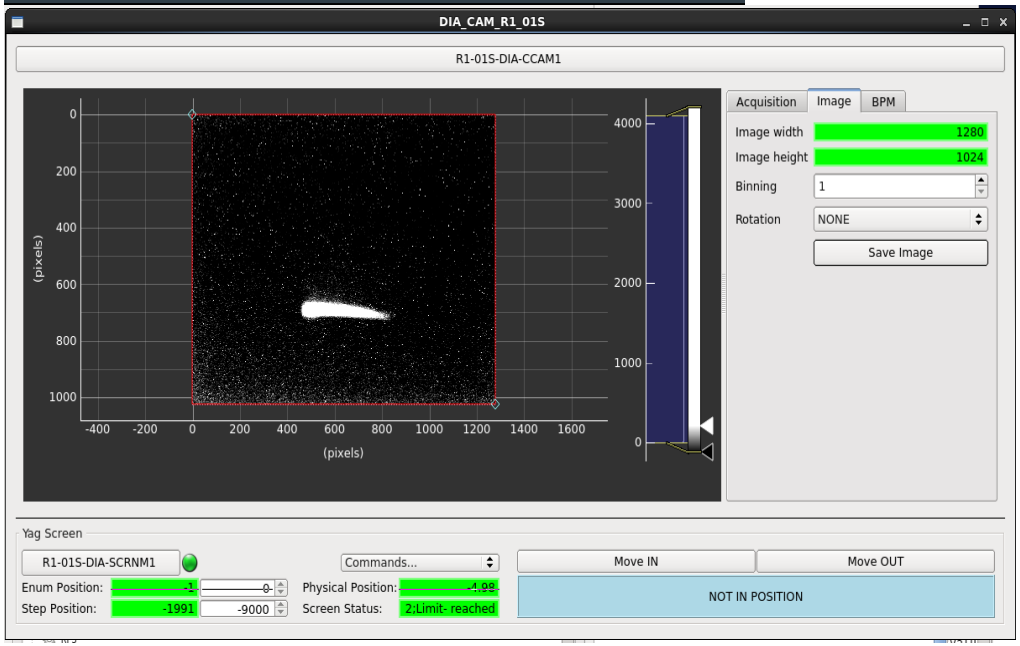
Current:

- at the entrance to the transfer line (yellow)
- Between bottom septum and dipole magnet (green)
- In the beam stoppers area (orange)

27.05.2015



Beam in the storage ring
Energy 320 MeV
Charge 1.5 nC
rep rate 10Hz

Accumulation & Stored beam

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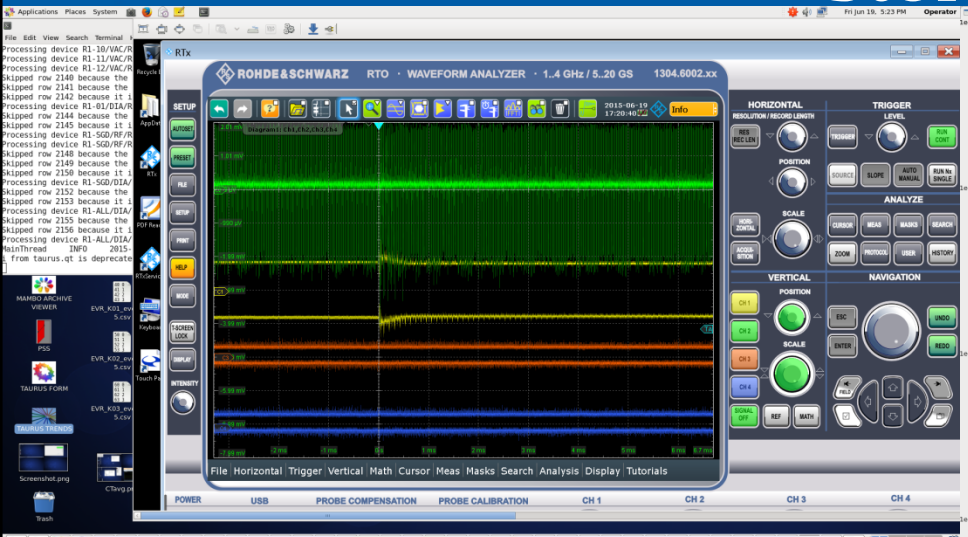
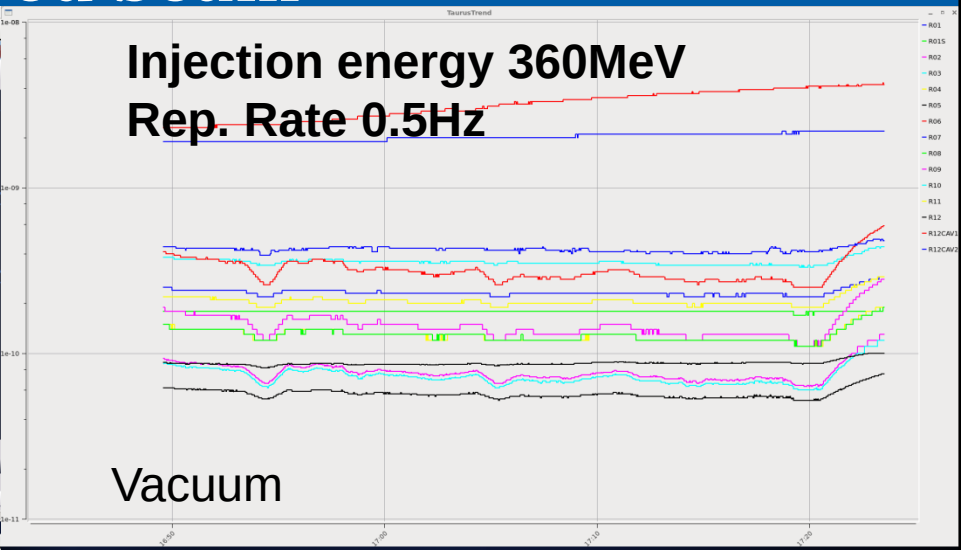
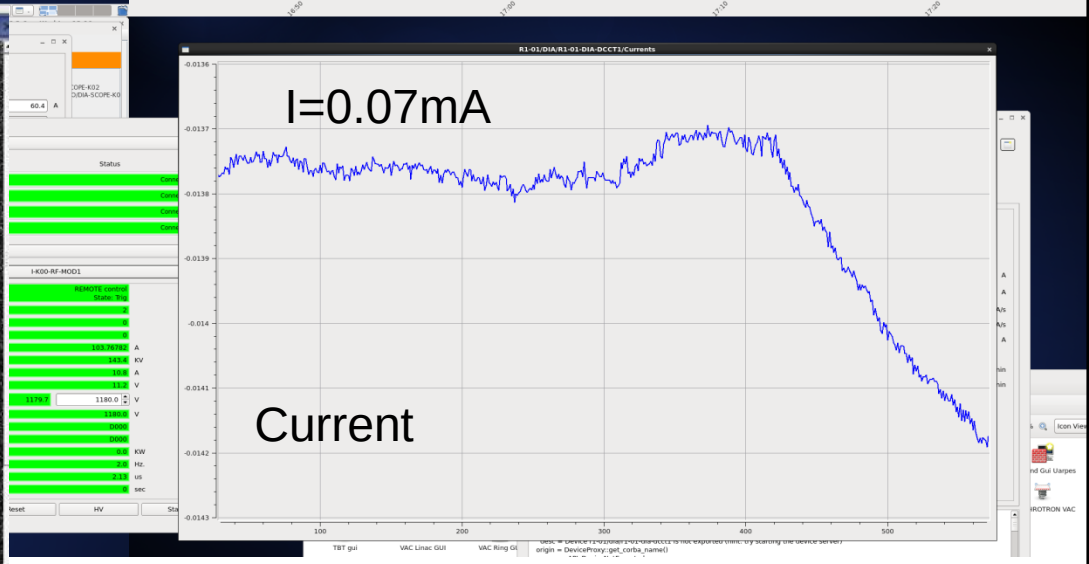






Solaris people involved in the CS related work

- **Krzysztof, Piotr (PLC)**
  - Machine ProtectionSystem
  - Personal Safety System
- **Michal, Piotr K. (network)**
  - IT infrastructure and services
  - Help-desk
- **Lukasz (x2) and Wojtek**
  - Control system software
  - Outsourced Tango and students software development coordination
  - Motion control
- **Julia** (PhD. Student in IT, 30% of time)
  - General software development
  - Database applications
  - Students' projects coordination
- **Maciek** (diagnostics, electronics)
  - Recruitment of new electronic engineer
- **Arek** (hired within the PL-Grid Plus project, 50% of time)
  - Virtual accelerator
- **Tadeusz** (hired within the PL-Grid Plus project)
  - SynchroGrid coordination
  - HPC services
- **Piotr G.**
  - Coordination
  - Virtual accelerator
- **Students:** non-critical tasks, GUIs, helper tools

BL04

BL04 outline:

- Beamline parameters
- Layout
- End stations/experimental techniques
  - PEEM
  - XAS chamber

Alba:

- BL24 (CIRCE)

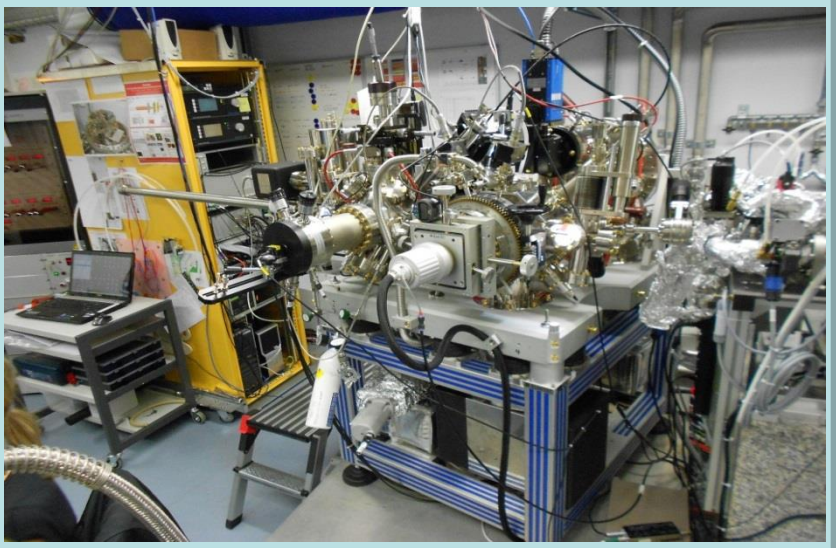
Maxlab:

- Beamline I511

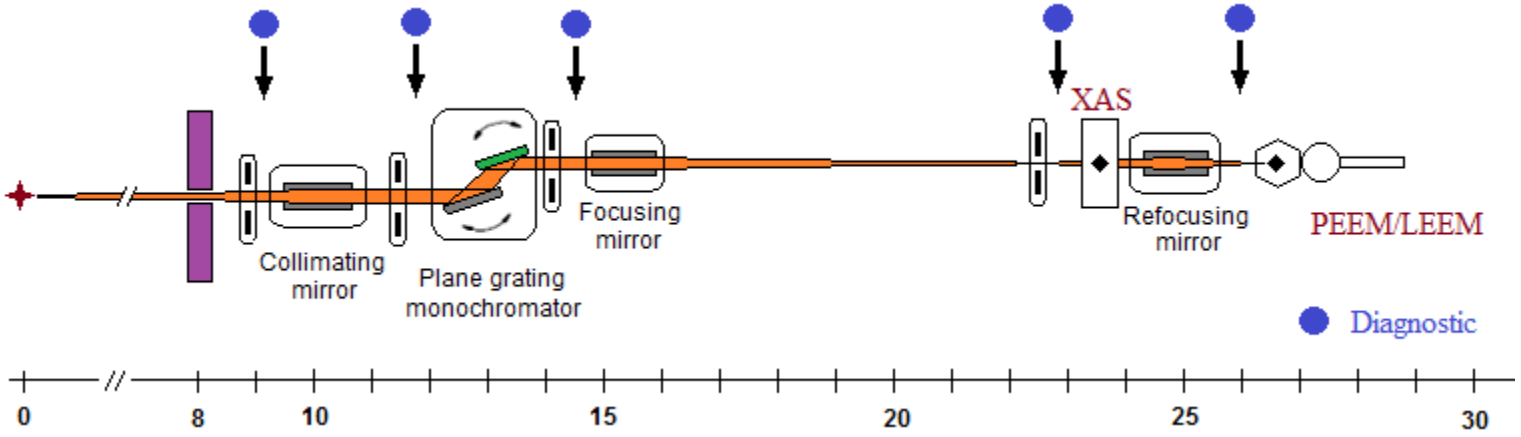
Beamline parameters

Main physical parameters:
(optimized from the end station point of view – PEEM)

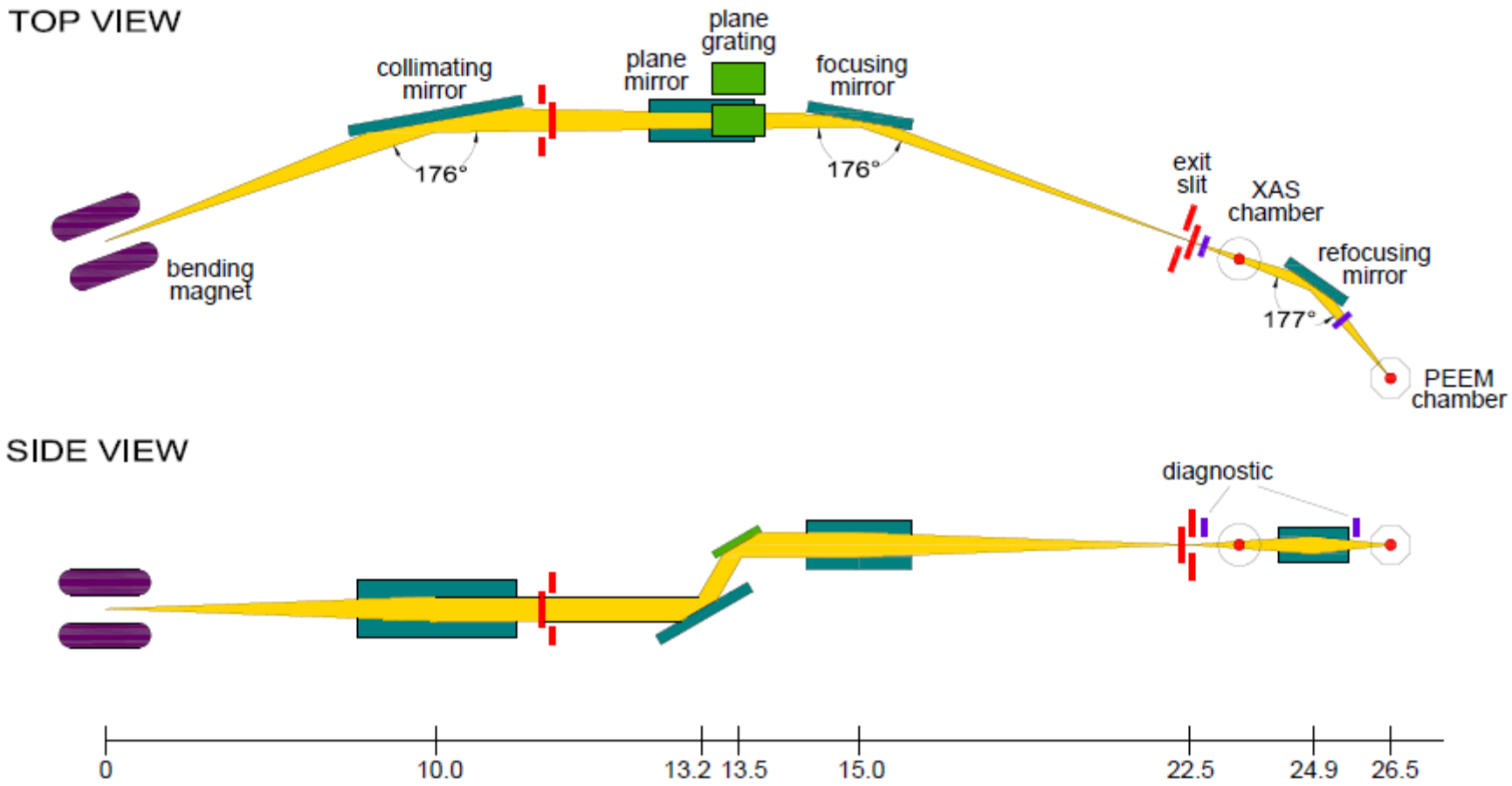
- Accessible energy range **200-2000 eV**
- **Energy resolution** E/dE = 4000 or better
- Beam size at the sample position (h x v)
  100 x 50 µm² for PEEM
  2 x 4 mm² for XAS
- Higher orders should be minimized
- Fixed exit slits
- Access to linear and circular (elliptical) polarization light



March 2012: PEEM at Swiss Light Source
Nowadays: Krakow, Solaris



Beamline layout

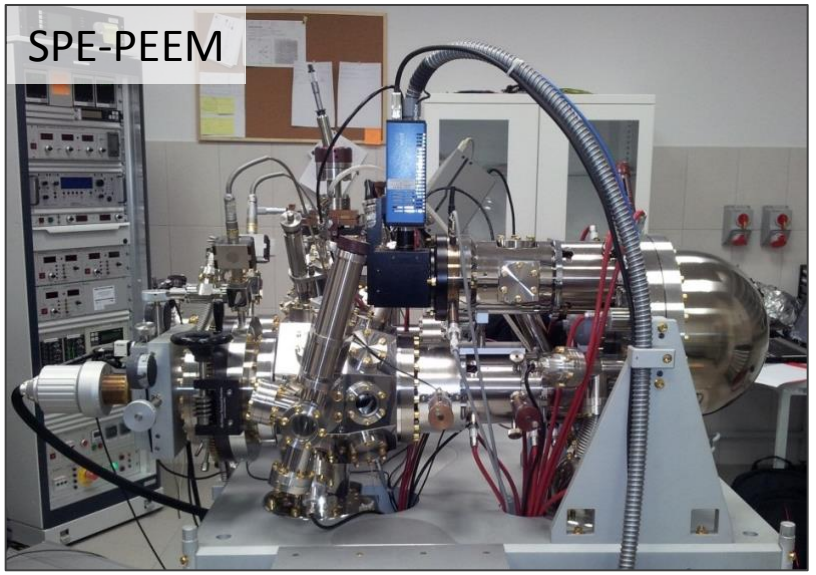


Main end station - PEEM

Installation: September 2015

Characteristics

- Producer: **Elmitec**
- **Photoelectron measurement**: imaging with chemical and magnetic sensitivity
- **Temperature range**: 100-1000K (for higher temperature disturbance for measurements)
- **Measurements in the UHV conditions**, conductive sample at 20kV potential
- **Preparation chamber** (sample growth in UHV, characterization by LEED/AES, ion gun)



SPE-PEEM

- FoV: 1.25 - 150μm
- spatial resolution PEEM: ~11nm
- spatial resolution XPEEM: ~25nm
  (cryterion 16-84%)
- analyzer energy resolution ~150meV

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XAS end station

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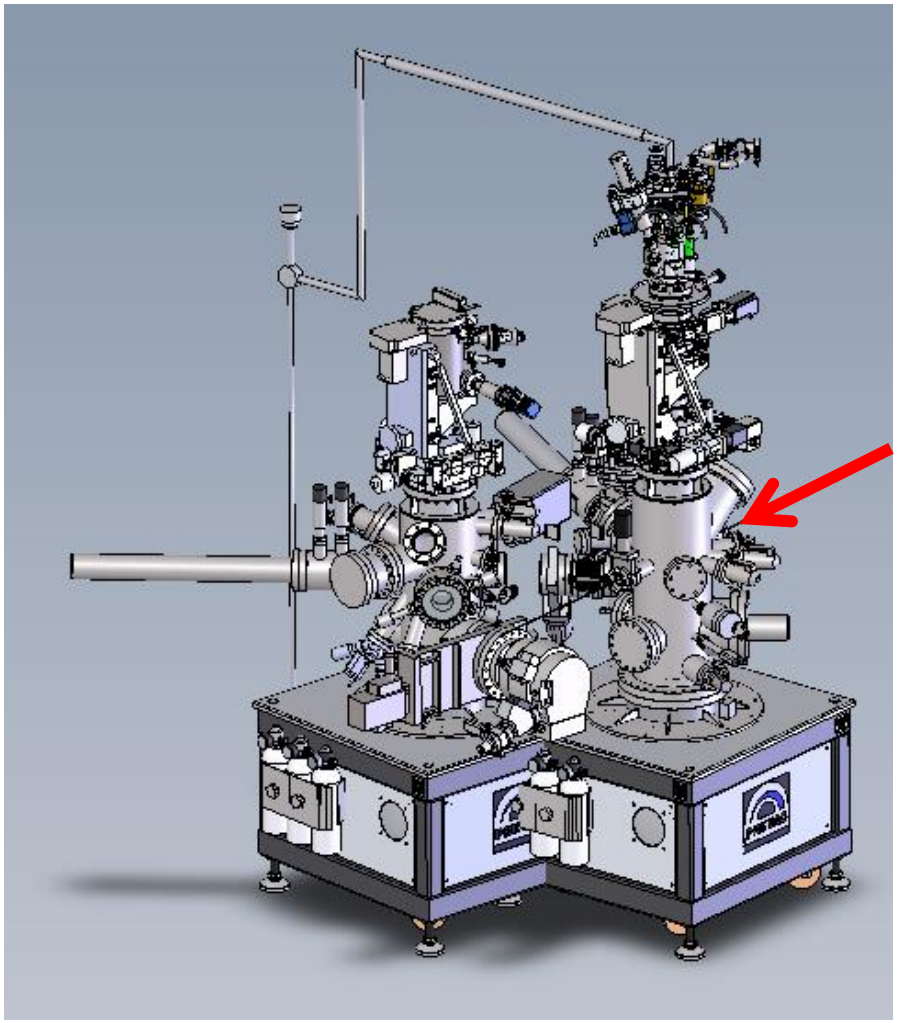

Delivery and installation is scheduled for the first half of **November 2015**

Main features of XAS end station:

1.The samples will be characterized using Total Electron Yield technique. Fluorescent detector (SDD) can be added in the future.

2.Temperature range: 20-1400K, LHe cryostat

3.Sample holders: flag style (Omicron type)

4.Possibility for measurements in low vacuum environment (~10 mbar of He)

5.Separate well equipped chamber for sample preparation and characterization (MBE, LEED, ion gun, temperature range 100-2000K)

6.Magazine for several samples

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Summary

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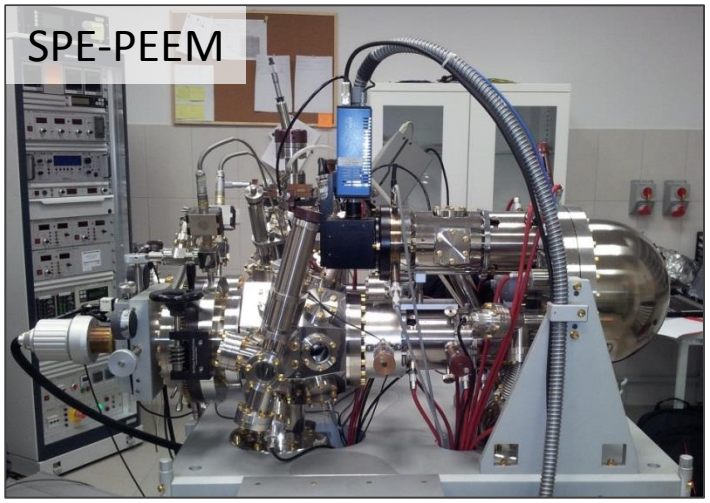
1. **Control system** (vacuum and motion part) will be configured to final version up to October 2015.
2. Beamline components installation is delayed. All activities should be finished up to mid of October 2015.
3. BL **second end station** is manufacturing. Delivery and installation is foreseen on November 2015.
4. **PEEM microscope is in Solaris**. Experienced team will install the microscope in the final location in few weeks.
5. We plan to **start beamline conditioning in October 2015** and **start commissioning in January 2016**.



INNOWACYJNA GOSPODARKA NARODOWA STRATEGIA SPÓJNOŚCI

spinLAB

UNIA EUROPEJSKA EUROPEJSKI FUNDUSZ ROZWOJU REGIONALNEGO

NARODOWE CENTRUM NAUKI

sciex.pl

Spock

Spock:

- **wa**
- **etc.**

```
Door_bl04bm_1 [4]: wa
Current positions (user, dial) on 2015-07-20 14:46:28.685987

     BDS1      BDS2      BDS3      BDS5      BDS6      BDS7       CFF    ENERGY
 102.0440   58.0000       nan       nan       nan       nan       nan       nan
 102.0440   58.0000       nan       nan       nan       nan       nan       nan

   ESCHAM       ESD      ESHG      ESHO       ESL       ESR       ESU       ESVG
      nan       nan       nan       nan       nan       nan       nan       nan
      nan       nan       nan       nan       nan       nan       nan       nan

     ESVO   GRPITCH       GRY   M1PITCH    M1ROLL       M1Y     M1YAW       M1Z
      nan       nan       nan    0.0000    0.0000    0.0000    0.0000    0.0000
      nan       nan       nan    0.0000    0.0000    0.0000    0.0000    0.0000

   M2EXCH   M2PITCH    M2ROLL       M2Y     M2YAW       M2Z   M3PITCH    M3ROLL
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      nan       nan       nan       nan       nan       nan       nan       nan

      M3Y     M3YAW       M3Z  PLMPITCH      PLMY     PREPR     PREPZ       S1D
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      nan       nan       nan       nan       nan       nan       nan   16.6050

     S1HG      S1HO       S1L       S1R       S1U      S1VG      S1VO       S2D
  49.0000    0.5000   24.0000   25.0000   25.0000   41.6050    4.1975   23.0000
  49.0000    0.5000   24.0000   25.0000   25.0000   41.6050    4.1975   23.0000

     S2HG      S2HO       S2L       S2R       S2U      S2VG      S2VO       S3D
  45.5000    0.7500   22.0000   23.5000   21.0000   44.0000   -1.0000       nan
  45.5000    0.7500   22.0000   23.5000   21.0000   44.0000   -1.0000       nan

     S3HG      S3HO       S3L       S3R       S3U      S3VG      S3VO        SR
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      nan       nan       nan       nan       nan       nan       nan       nan
```
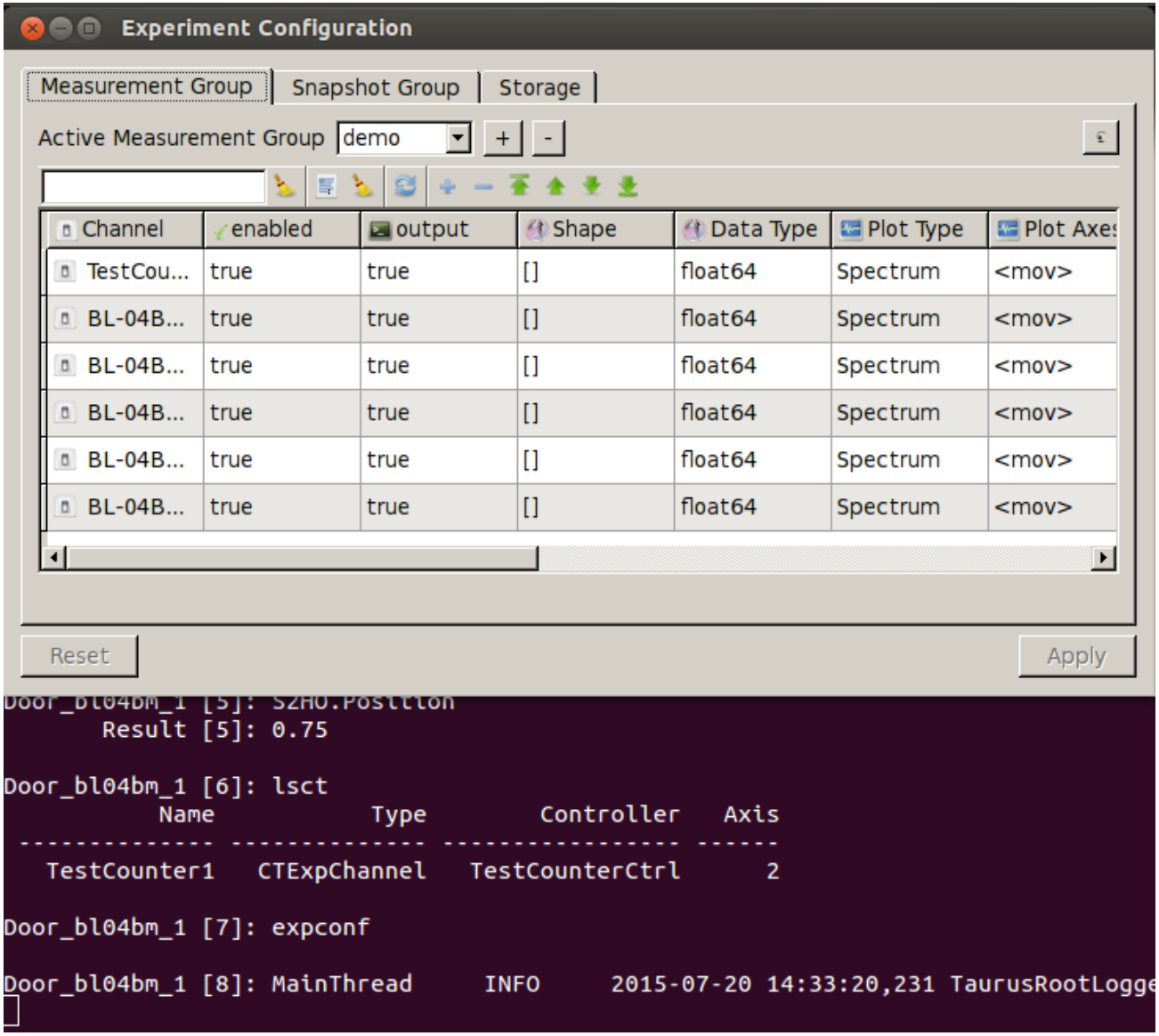
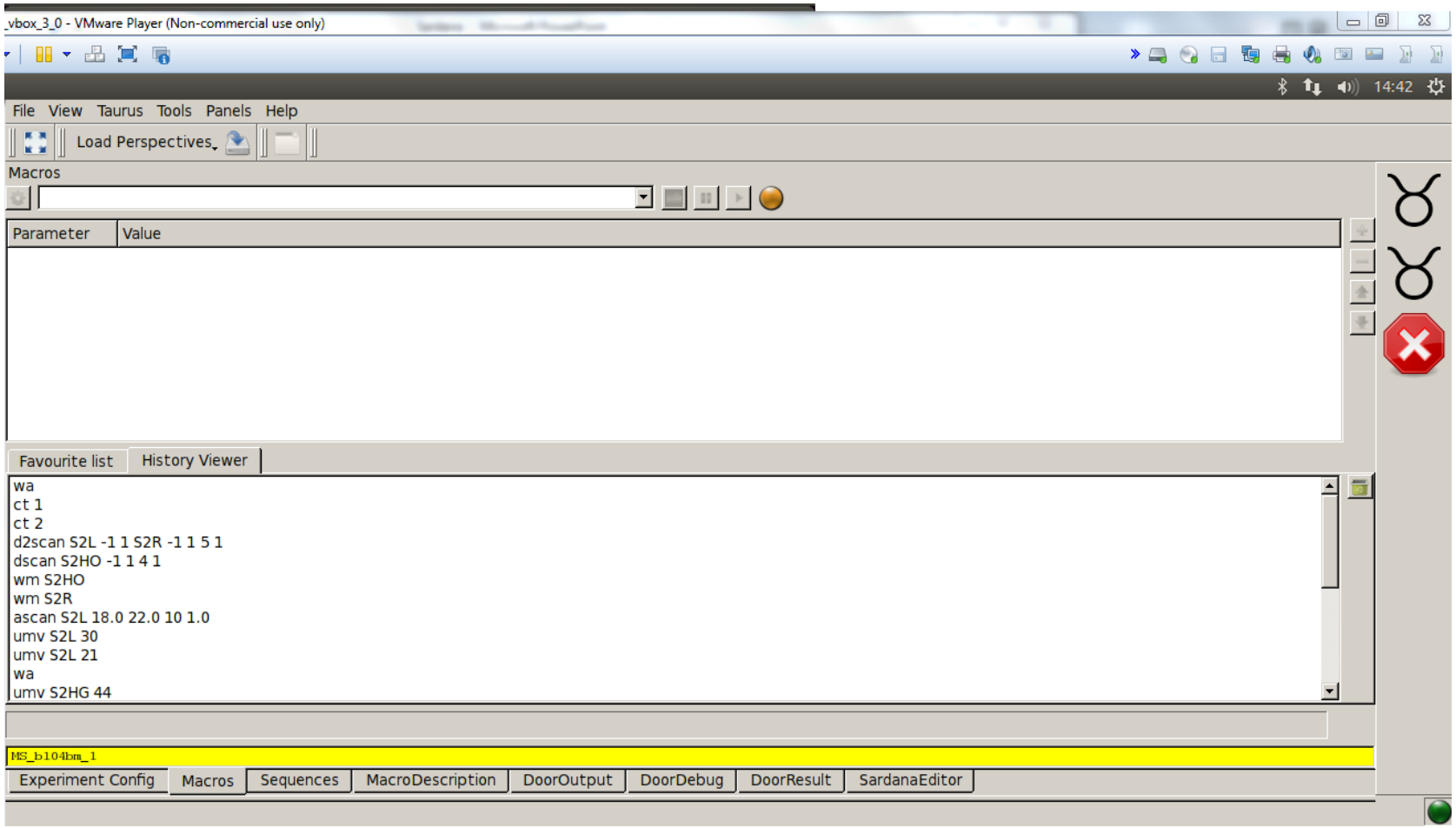

Spock

- **Measurement Group**



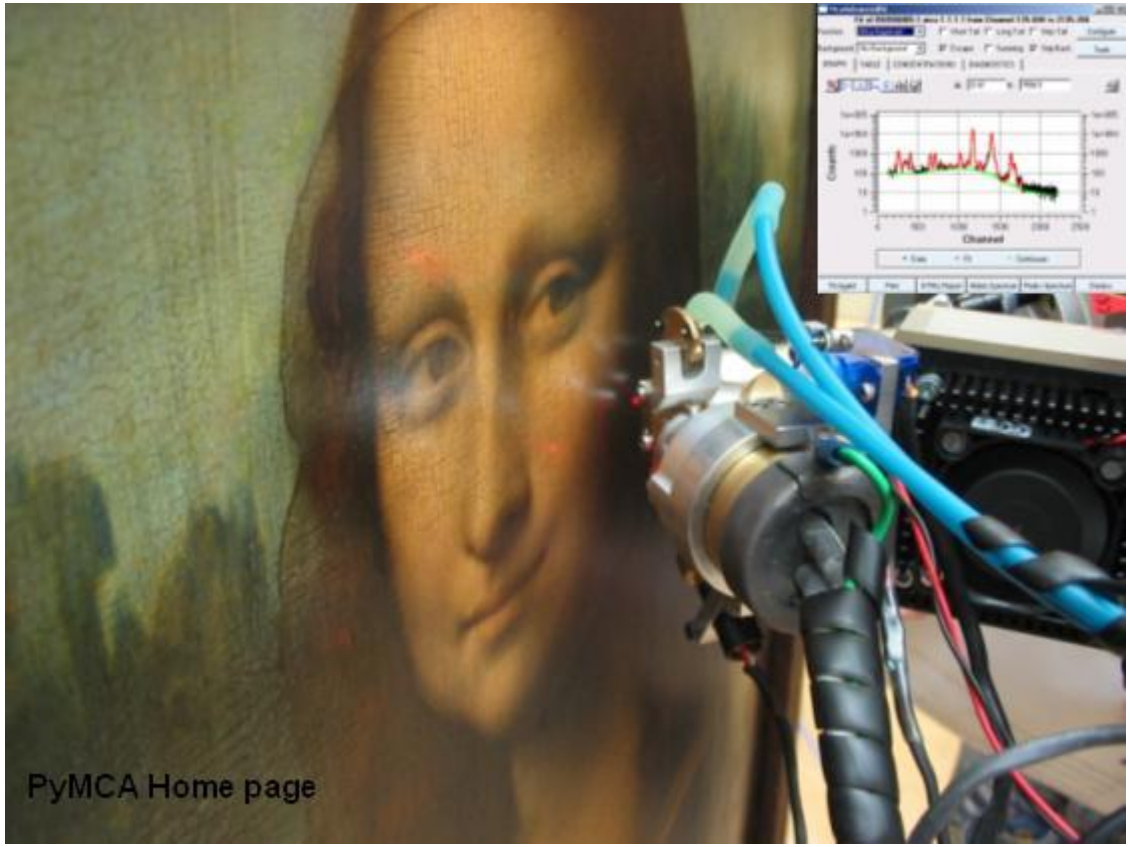
- **Macro execution**



Sardana

- **Beamline software**

PyMca



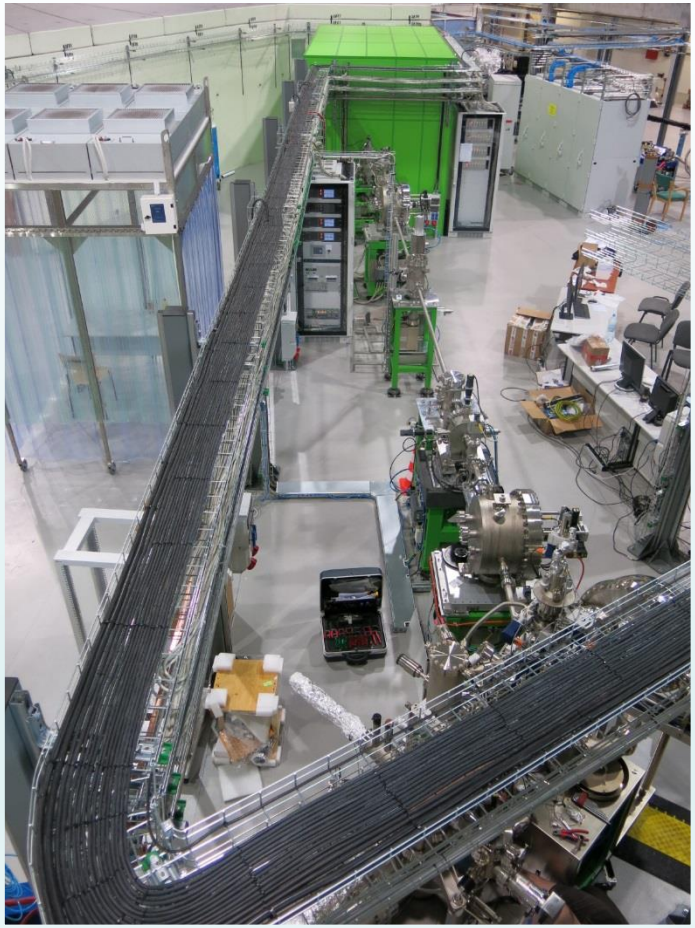
BL05

BL05 outline:

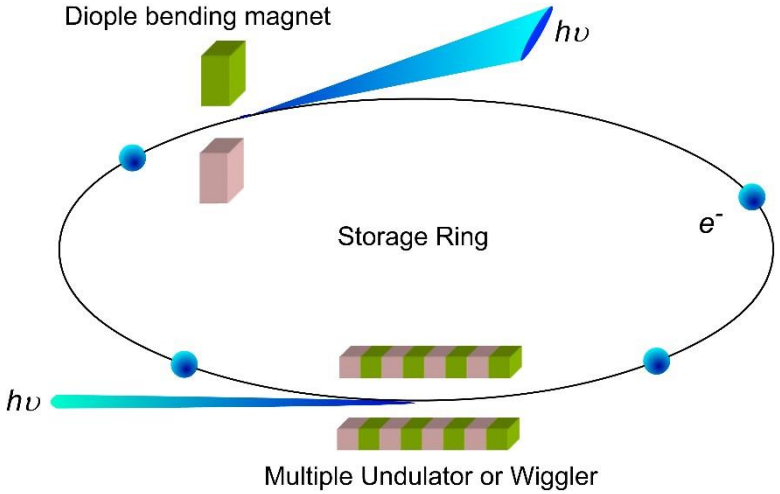
- Beamline source
- Optical elements
- Analyzer
- End station

MaxIV:

- ARPES

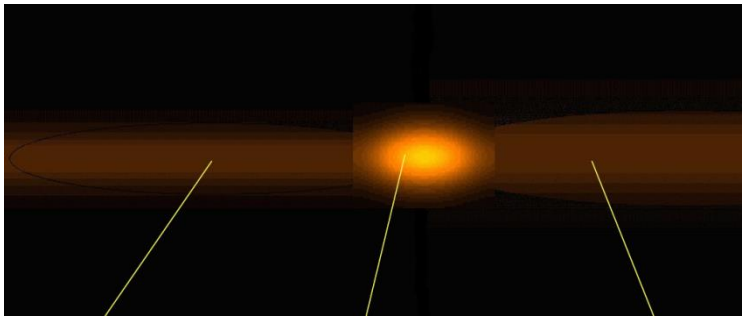


BL05 - SOURCE



Insertion device

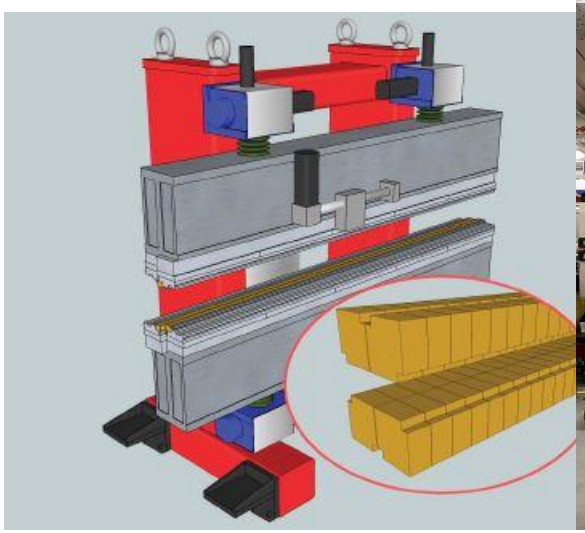
- magnetic periods: 120mm
- Electron Energy 1.5 GeV
- No of periods N= 21
- Gap min18mm
- Gap max 220 mm
- Total power 600 W

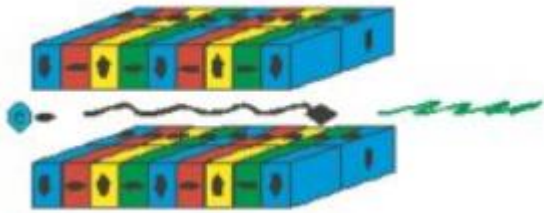


BM Radiation after straight section

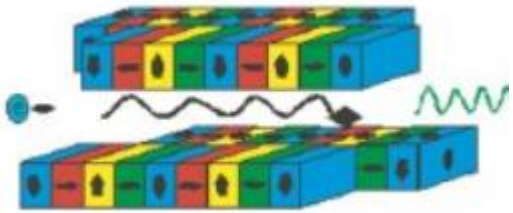
Undulator radiation

BM Radiation before straight section

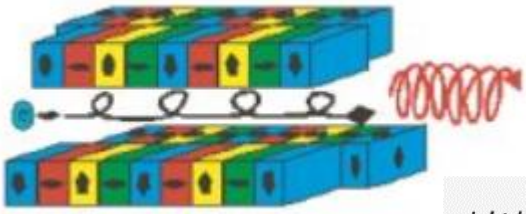




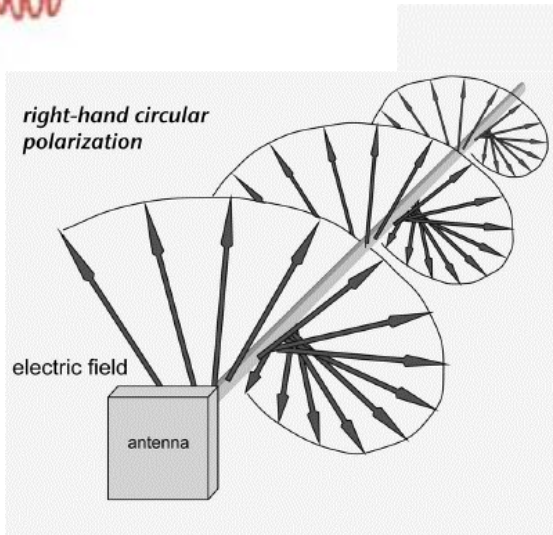
Linear Horizontal Polarization

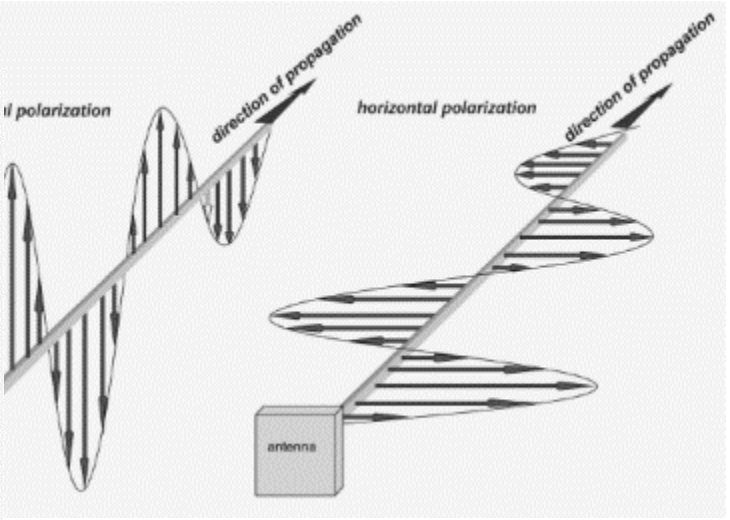


Linear Vertical Polarization



Circular Polarization





OPTICAL ELEMENTS

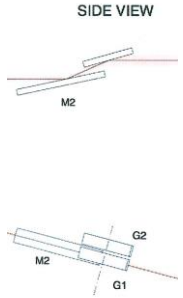
Monochromator

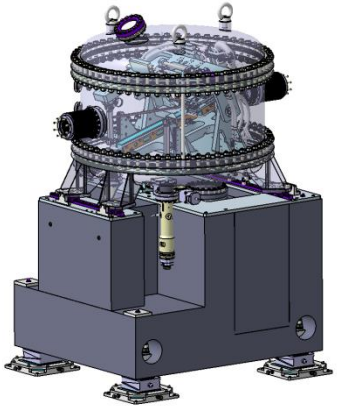
Two gratings and one mirror (laminar plane)

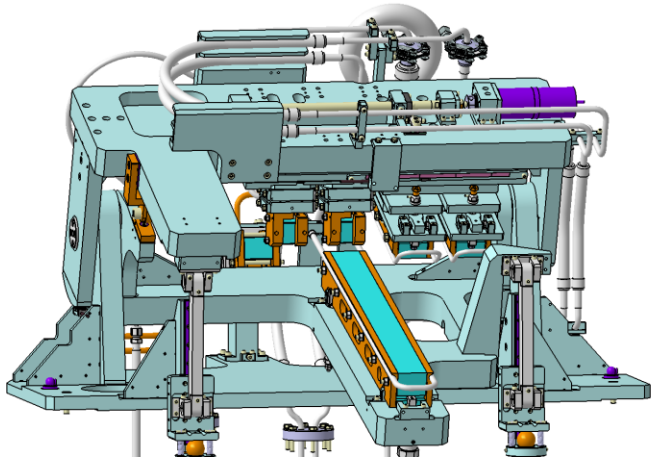
Combines two configurations:

1. **Normal Incidence (NIM) to operate in 8-30 eV**
2. **And Planar Grating (PGM) to operate in 16-100 eV**

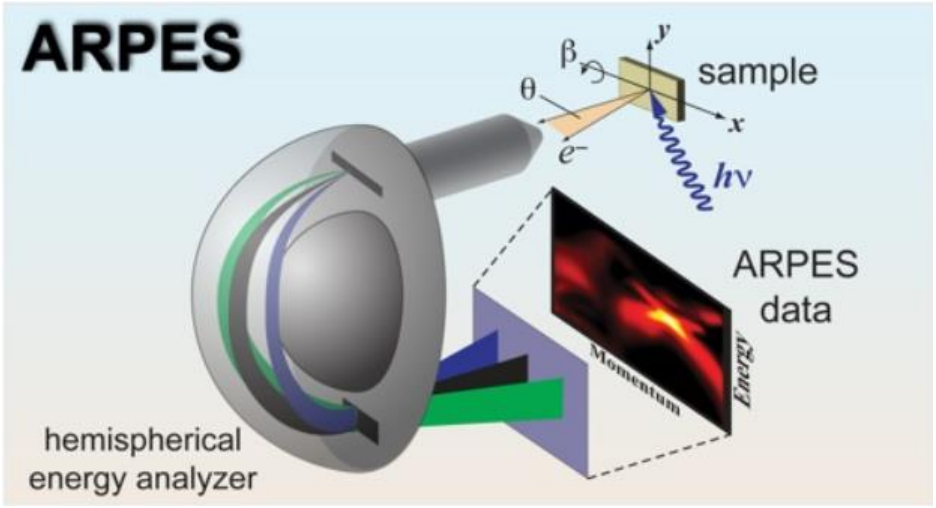
Resolution Power 20 000







ANALYZER



- Hemisphere analyser DA-30 L z VG-Scienta, Sweden, (State-of-the-art)

Detector controlled by MCP-CCD camera

Source: Department of Physical Chemistry Electronic Structure of Surfaces and Interfaces Group

- Camera CCD
- Transmition Speed -400Mbit/s
- Signal to noise lowering
- Noise eliminated during image data acqvisition
- Spectrum can be collected in few seconds by photo aquisvision directly from detector in liminted band energy.

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END STATION

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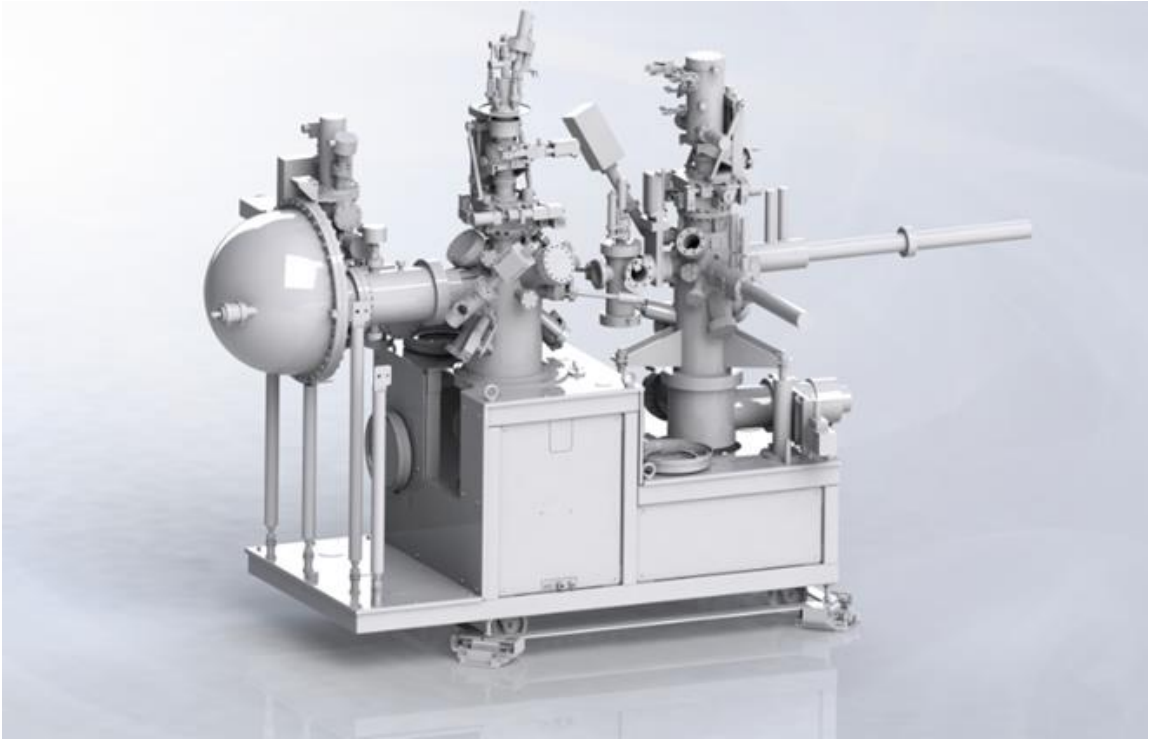


- Preparation chamber adopted for standard in situ techniques; effusion cells for thin film growth, sample cleaving, control of surface reactions in the gas phase.

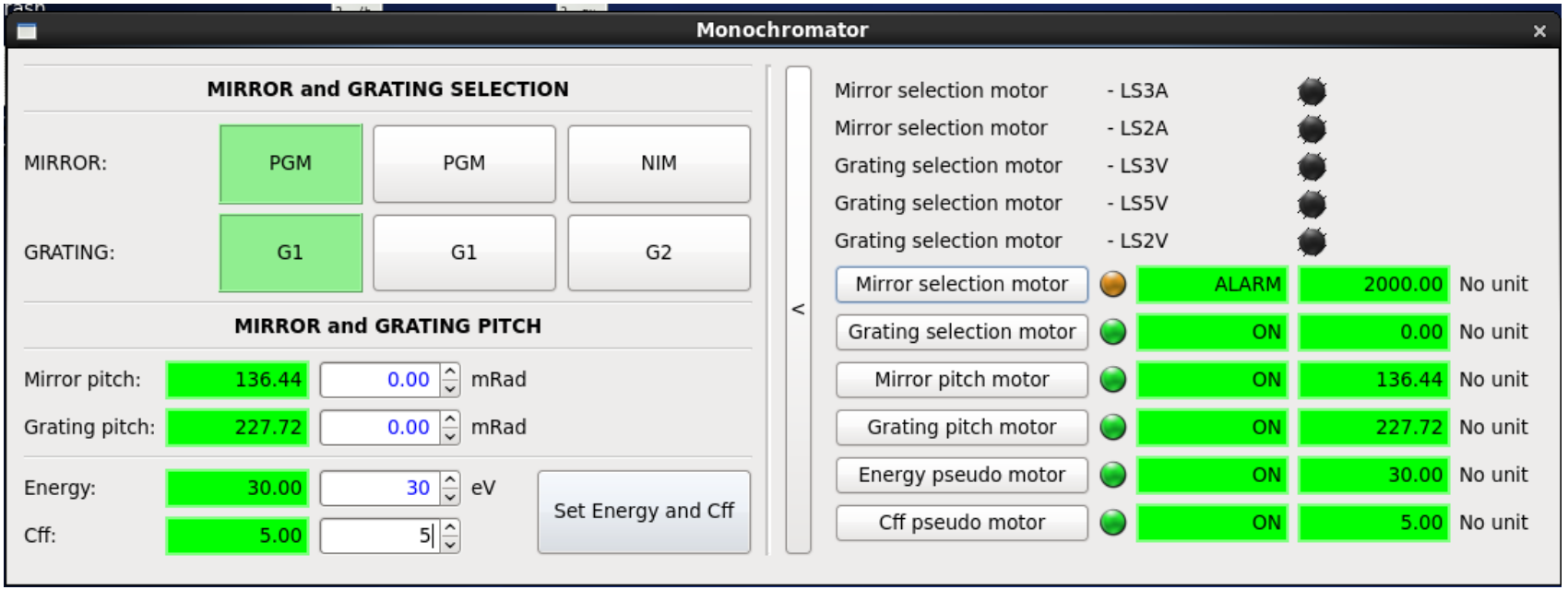
Analyser Chamber

- Designed and constructed by PREVAC in Poland

- The **cryogenic manipulator** from PREVAC will include Lhe flow type cryostat and will have 3 translational and 2 rotational high precision axes **fully automatized**. Temp: **8-500K**

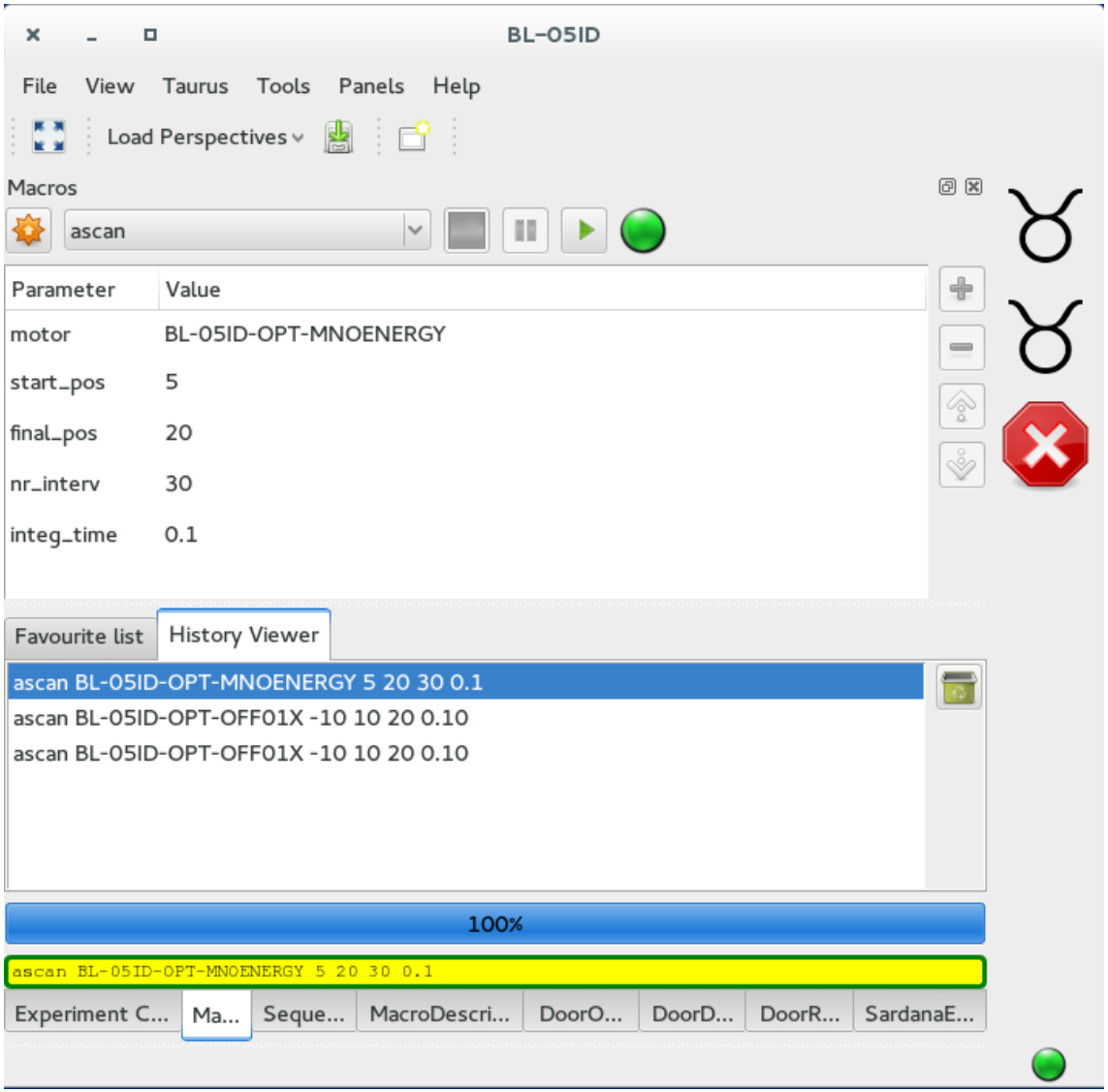
- Equipped with tools for **surface structure analysis** and **sample orientation techniques** like Low energy electron diffractometer (OCI MCP LEED).

- **Main widget for BL05 modulator:**



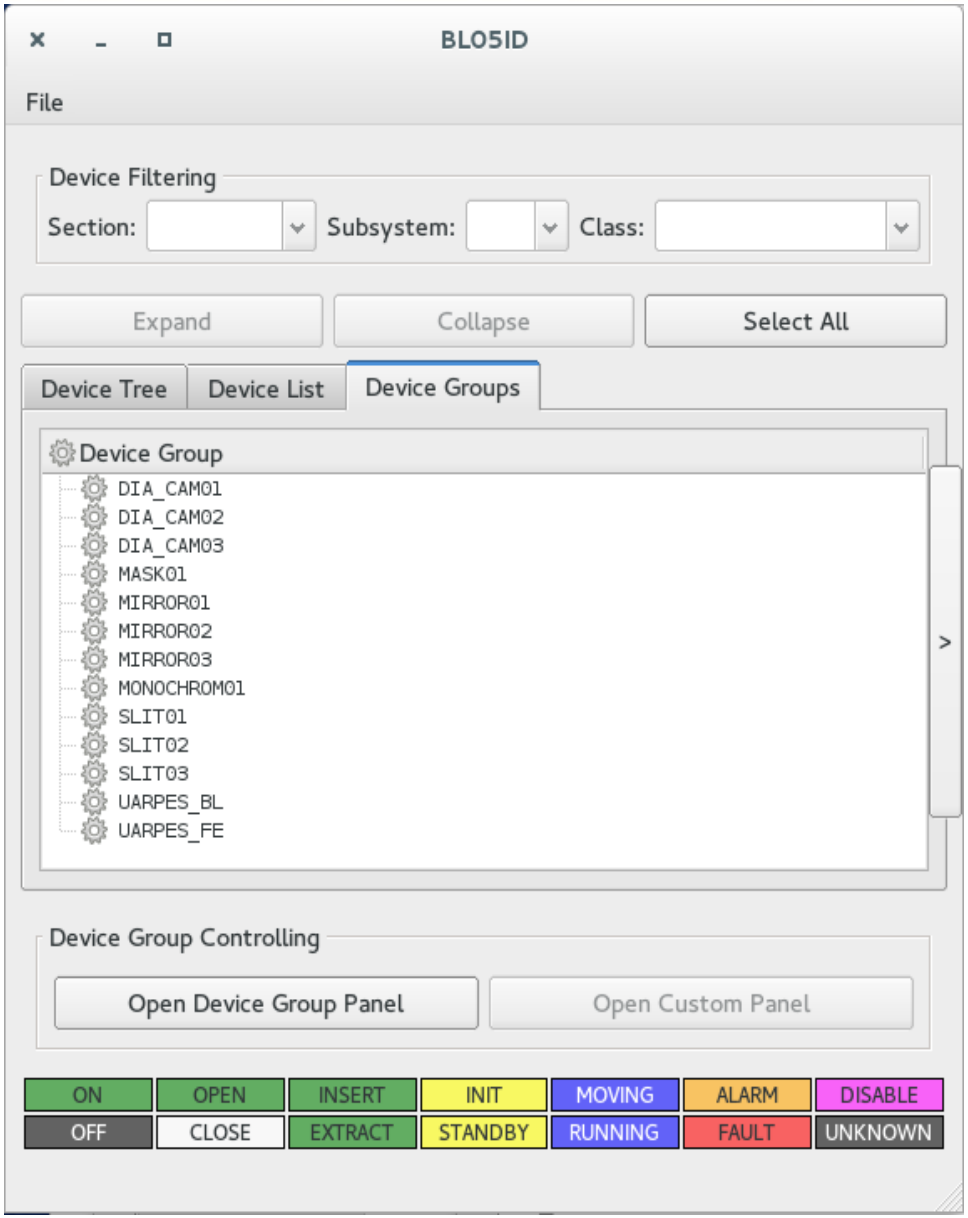
Sardana

- **Macro execution**



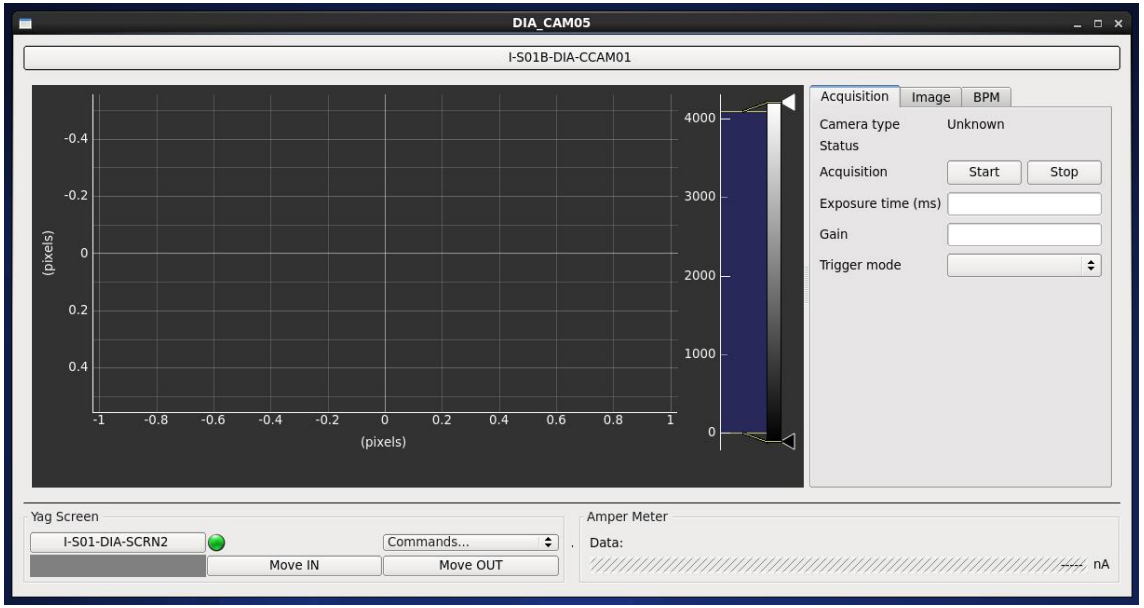
Sardana

- **Control Program**

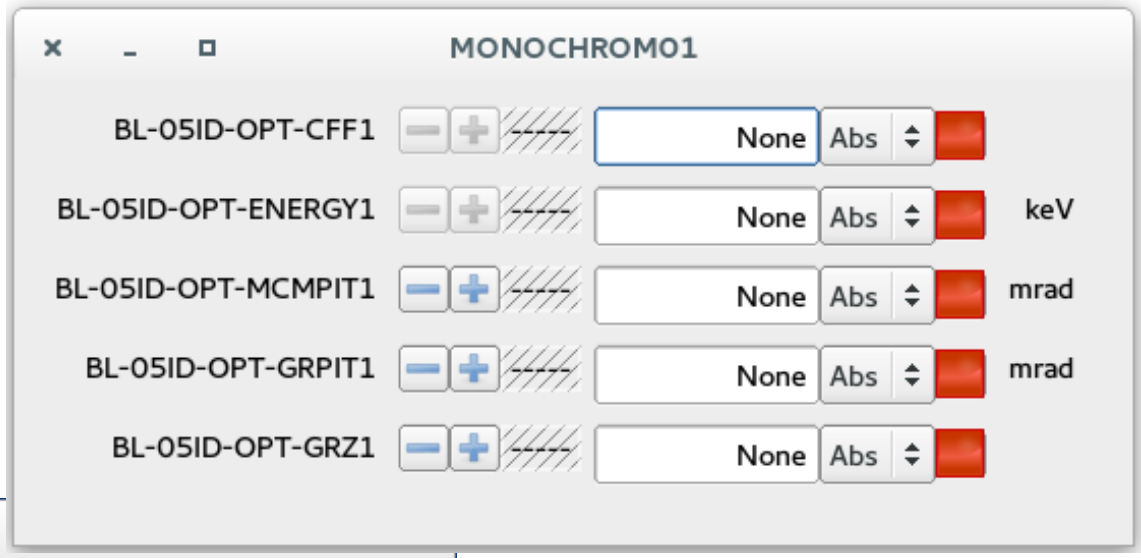


Sardana

- **YAG screen/camera GUI**



- **Motors**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BL-05ID-OPT-CFF1
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Abs
keV
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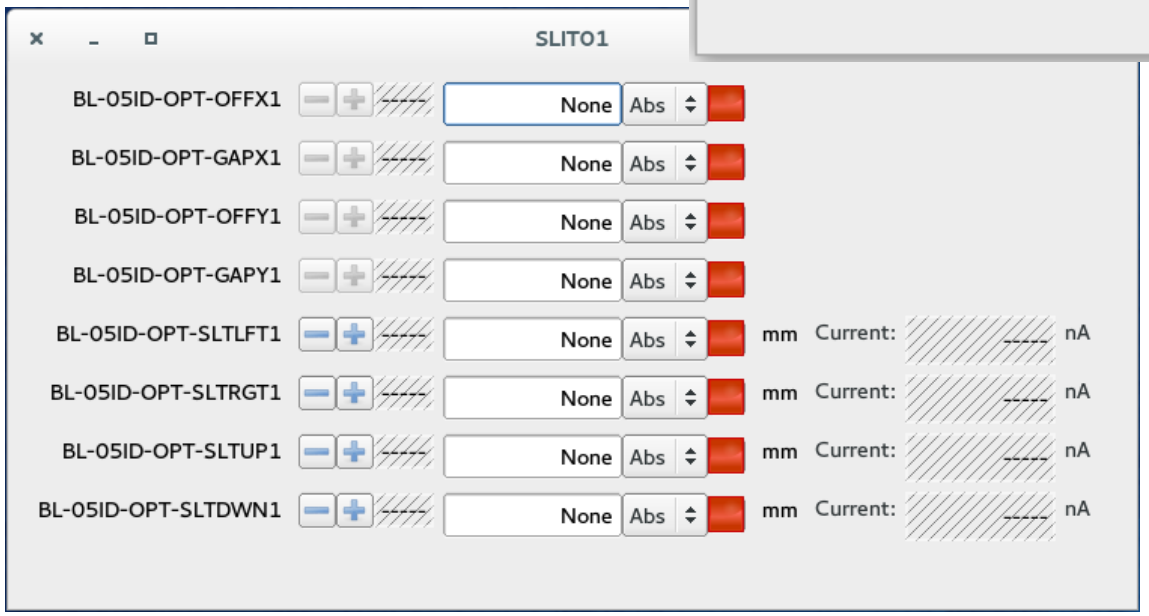
Abs
mrad
BL-05ID-OPT-GRPIT1
None
Abs
mrad
BL-05ID-OPT-GRZ1
None
Abs


SLITO1
BL-05ID-OPT-OFFX1
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Abs
BL-05ID-OPT-GAPX1
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BL-05ID-OPT-OFFY1
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Abs
BL-05ID-OPT-SLTLFT1
None
Abs
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Abs
mm
Current:
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BL-05ID-OPT-SLTUP1
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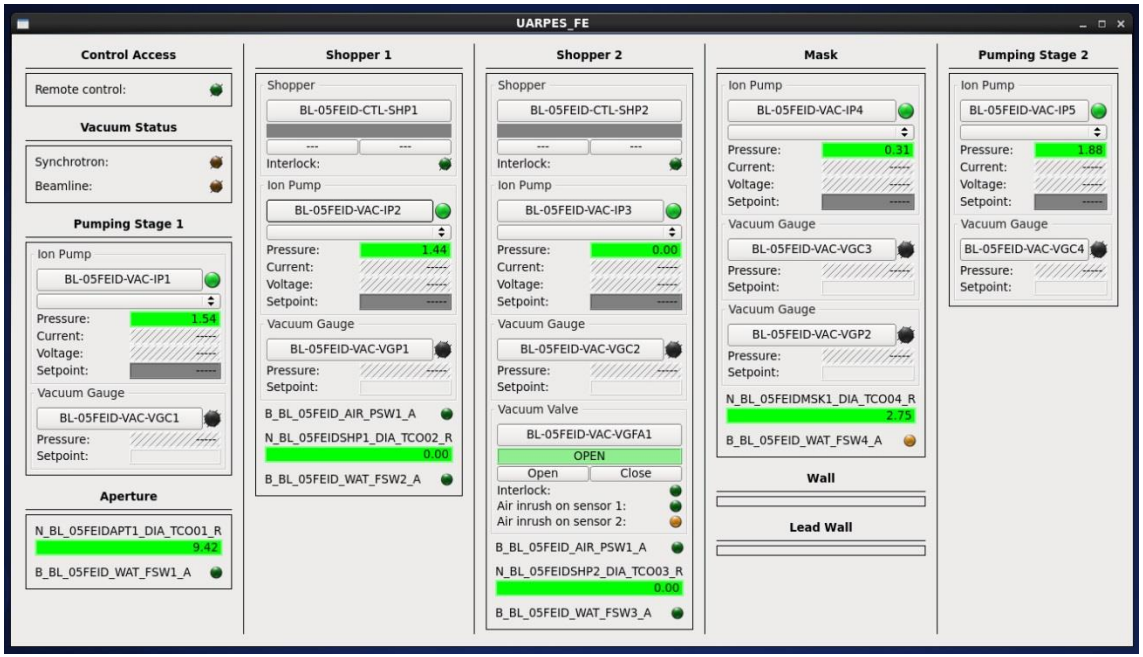
Abs
mm
Current:
nA
BL-05ID-OPT-SLTDWN1
None
Abs
mm
Current:
nA

Sardana

- **Front end vacuum and machine protection control screen**



- **Beamline vacuum and machine protection control screen**

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Future development

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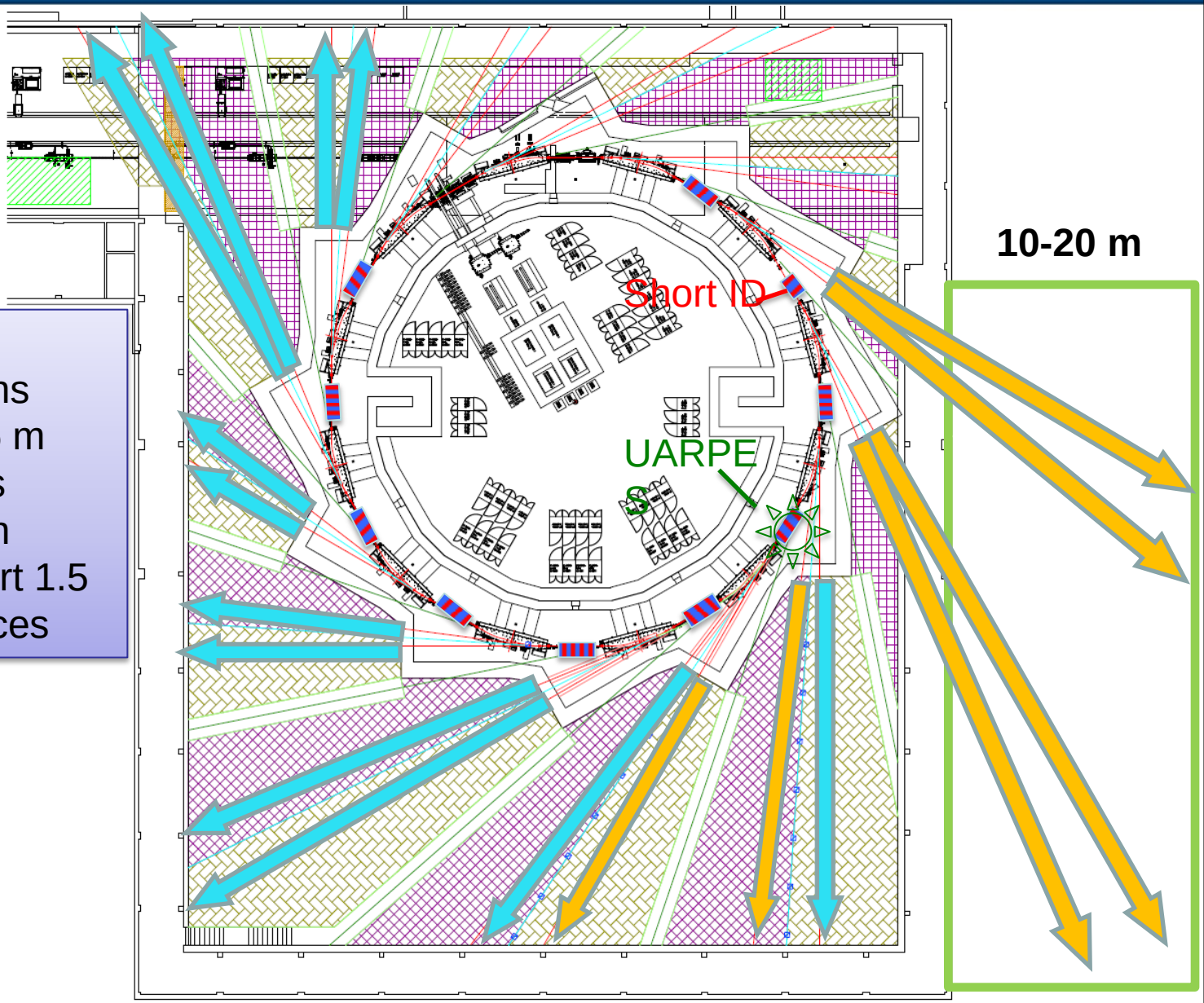
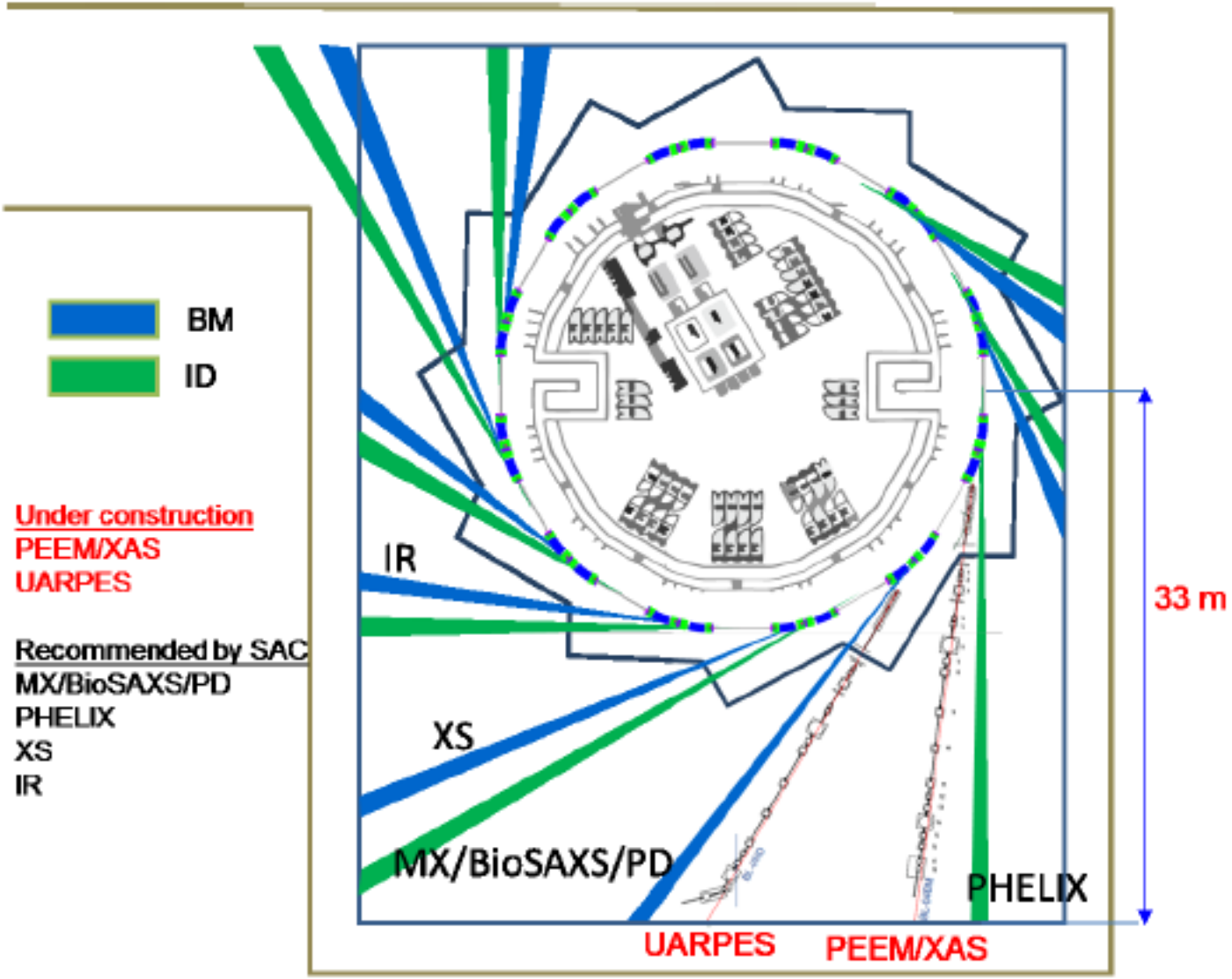
Future Beamlines:

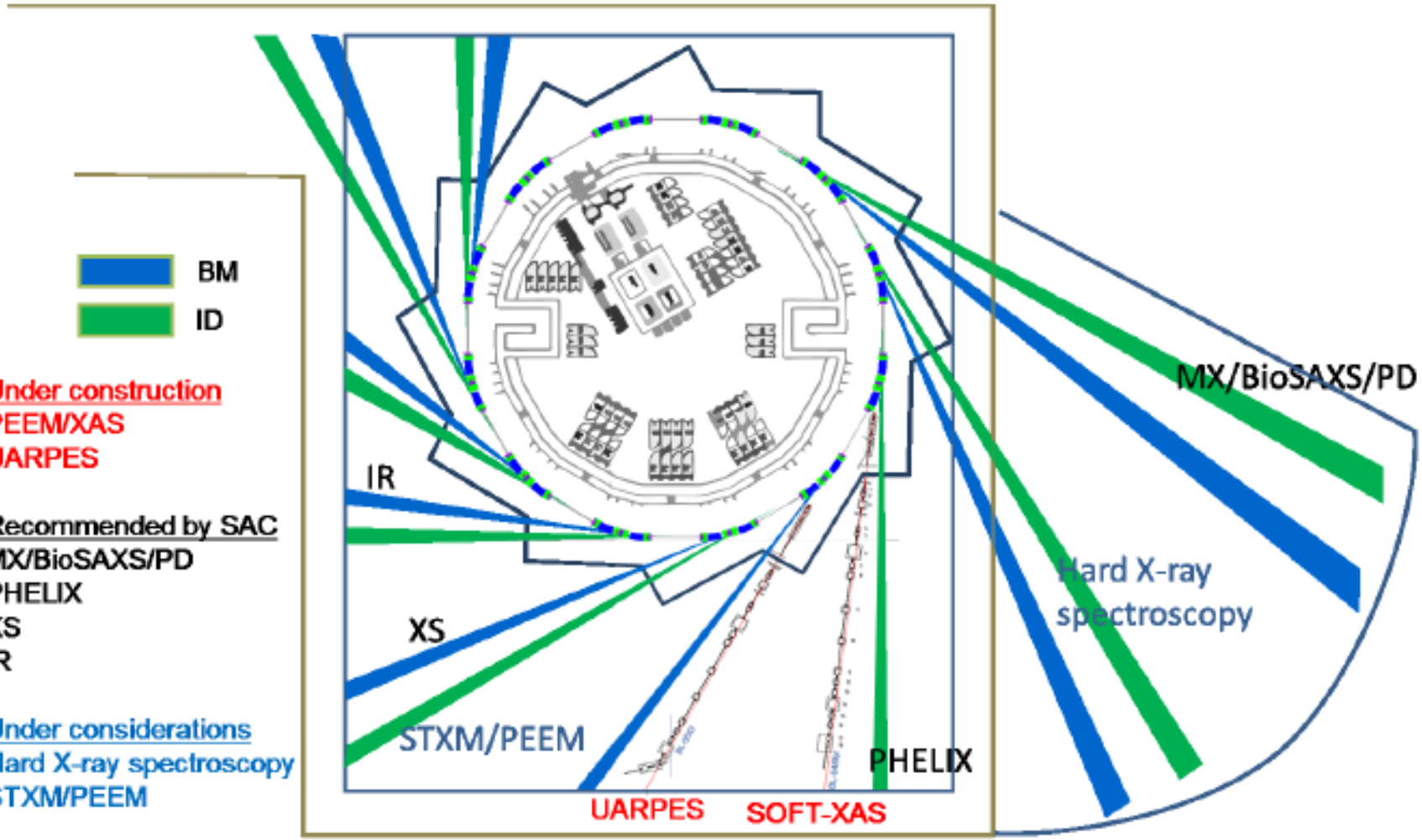
1. 8 straight sections available for 2.6 m insertion devices
2. 1 straight section available for short 1.5 m insertion devices



Next beamlines A



Next Beamlines B



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Thank You

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References:

www.synchrotron.pl

www.tango-controls.org

ALBA DESY SOLEIL SYNCHROTRON elettra

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