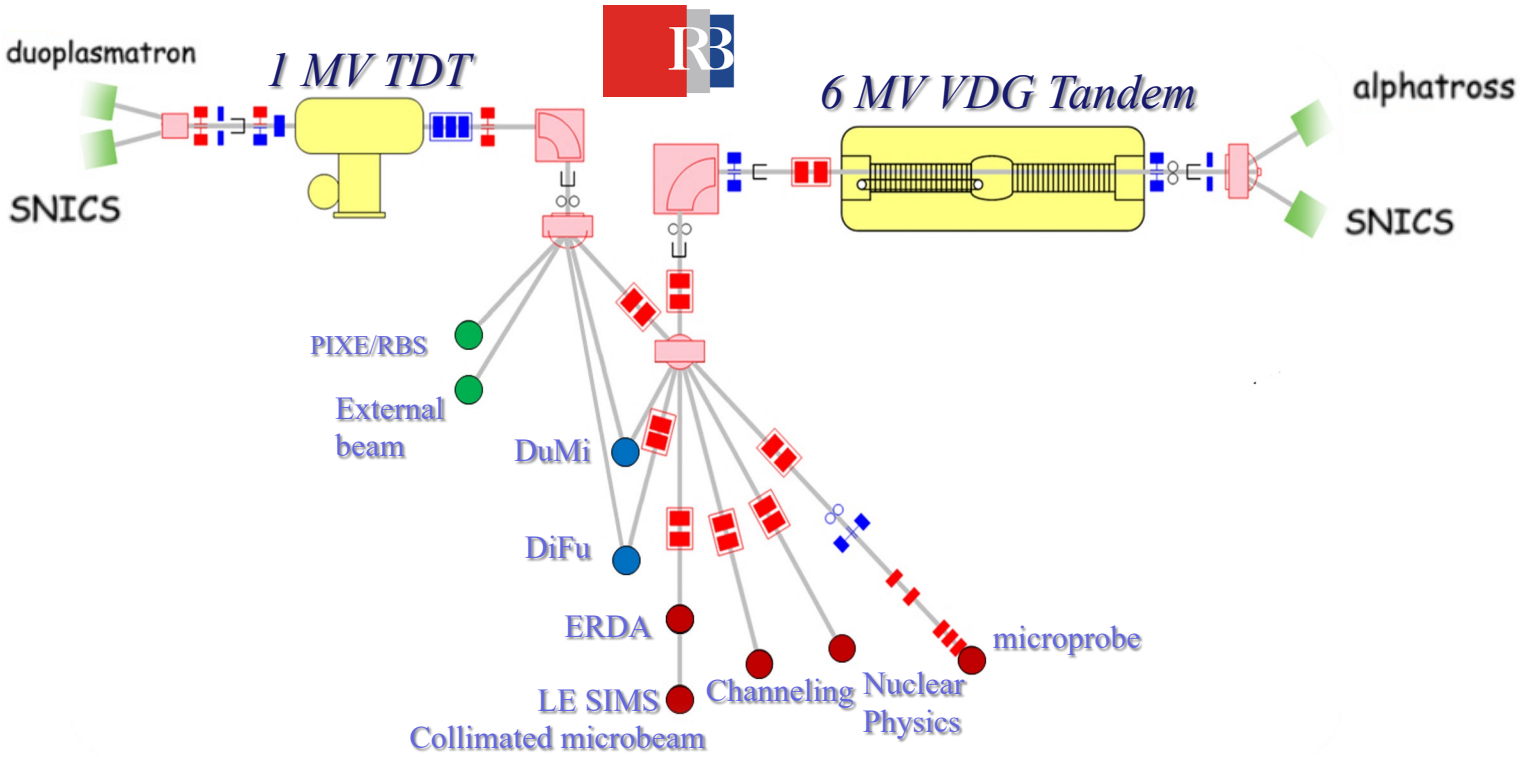
Task 4.2: Micro beam upgrade at the RBI accelerator facility

Georgios Provatas

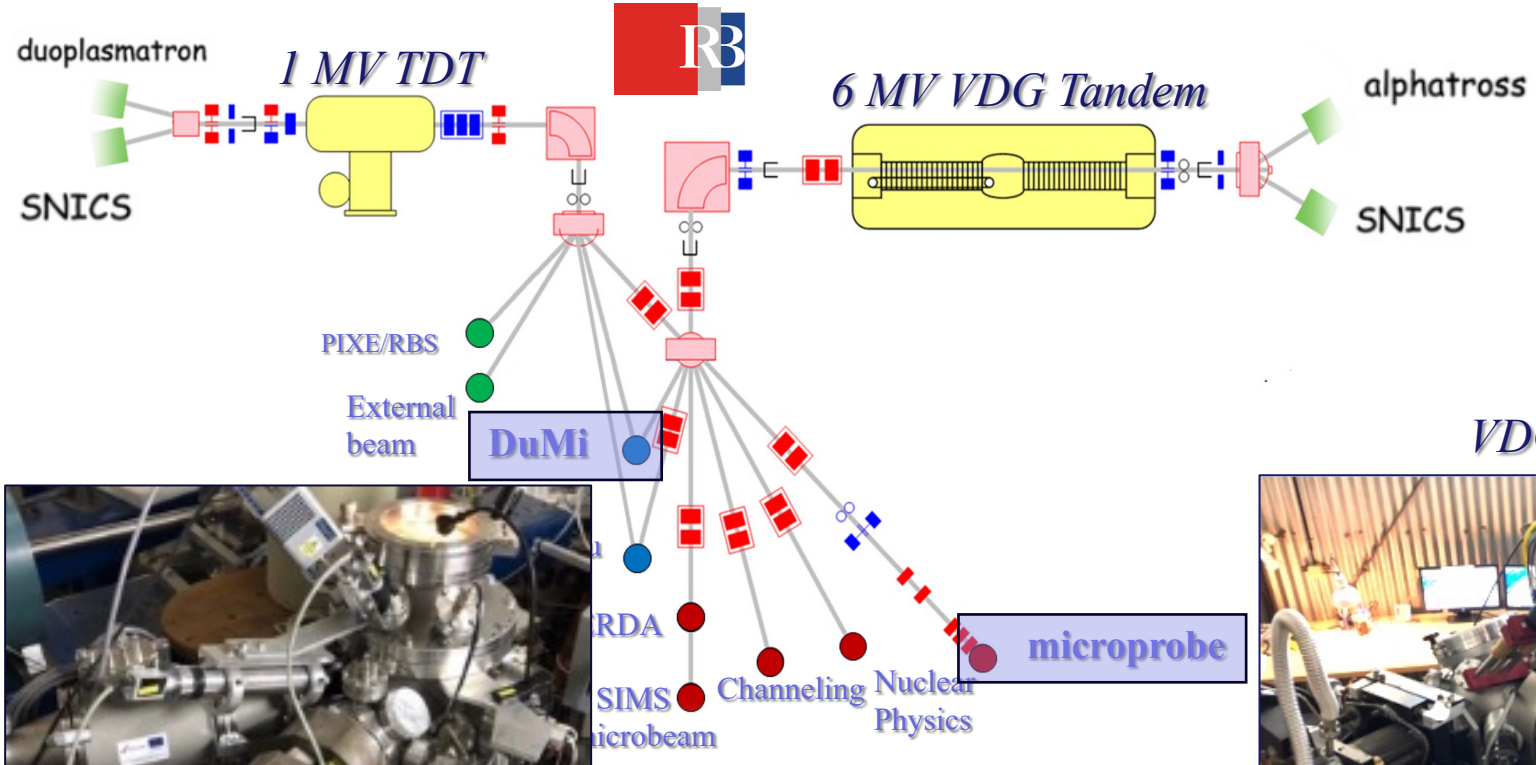
Task 4.2: Micro-beam upgrade at RBI accelerator facility

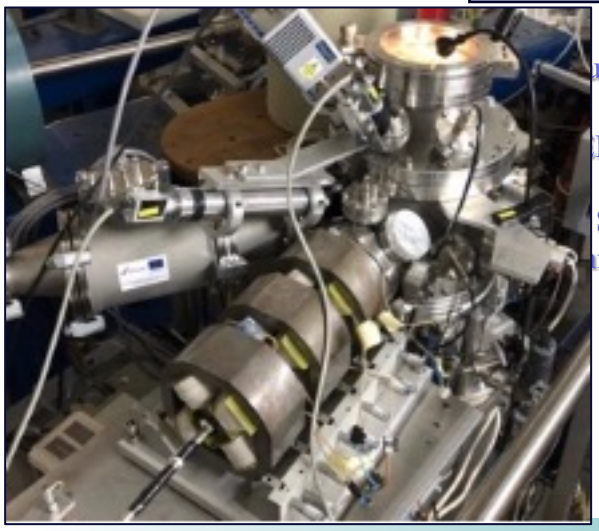
The RBI accelerator facility infrastructure



Task 4.2: Micro-beam upgrade at RBI accelerator facility

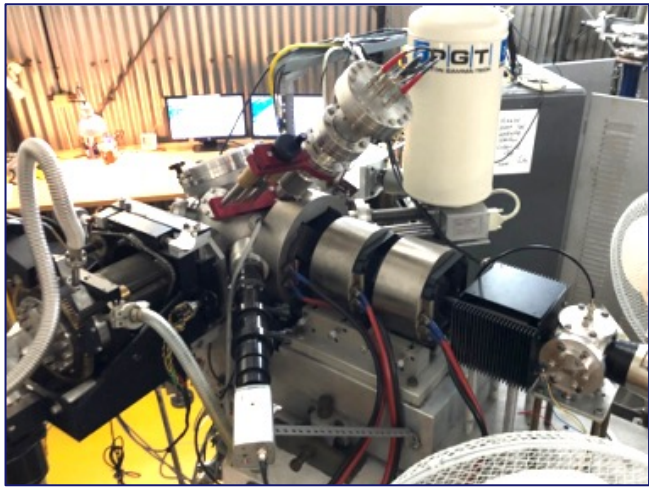
The RBI accelerator facility infrastructure



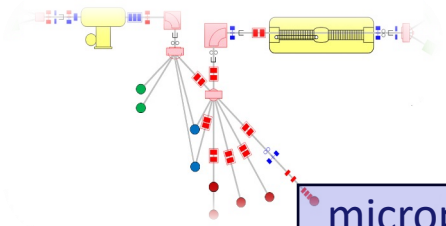


VDG & TDT

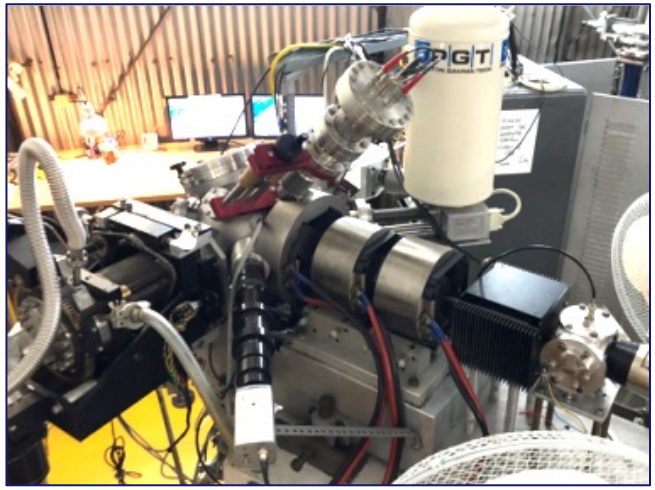
VDG or TDT

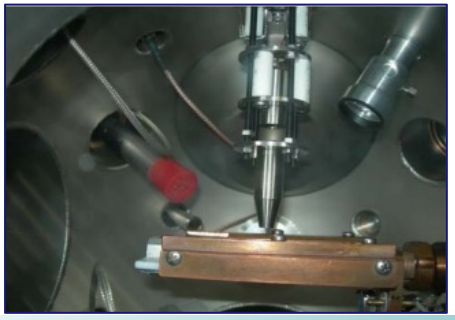


Task 4.2: Micro-beam upgrade at RBI accelerator facility



microprobe

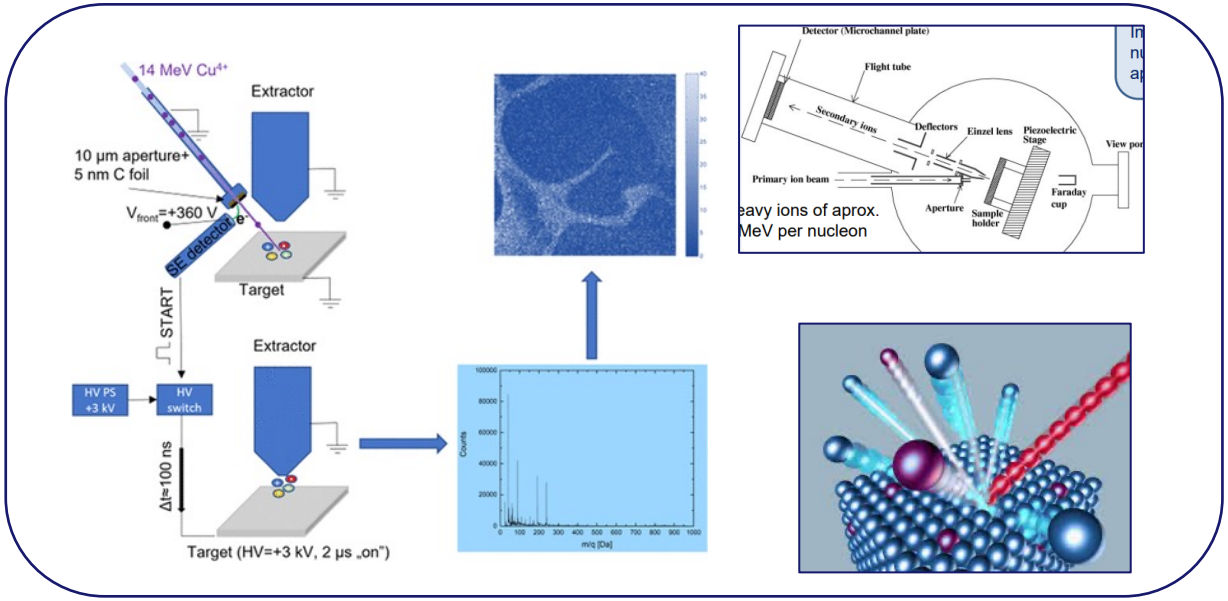




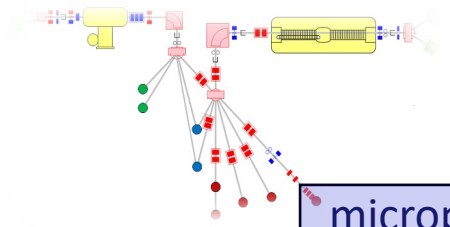
Activities at the microprobe (since 2nd Annual meeting)

CRP project "Access to Ion Beam Techniques of the RBI Accelerator Facility". Z. Siketić

Chemical Imaging of Organic Materials by MeV-SIMS



Task 4.2: Micro-beam upgrade at RBI accelerator facility

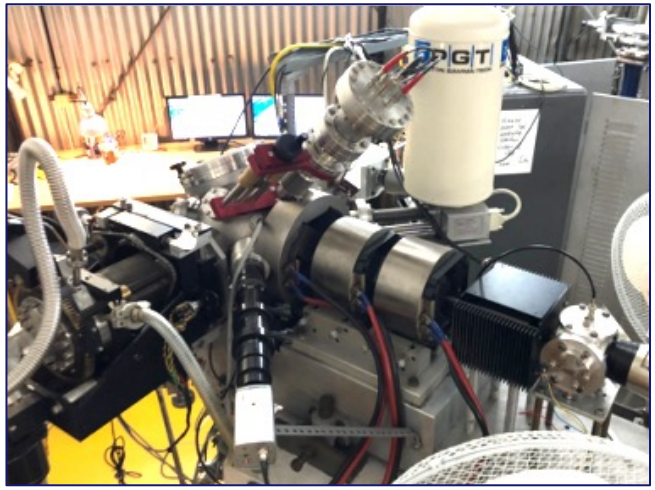


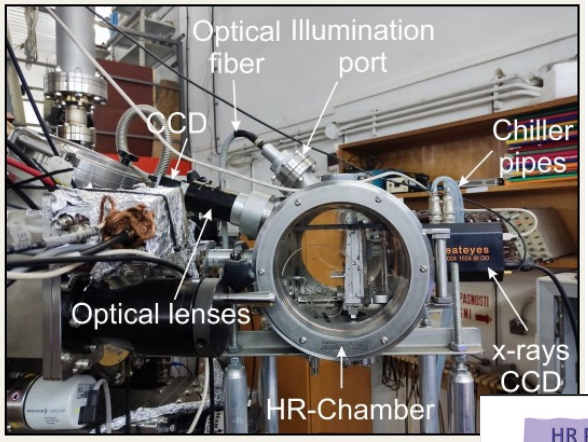
microprobe

Activities at the microprobe (since 2nd Annual meeting)

S. Fazinić, I. Bozičević Mihalić

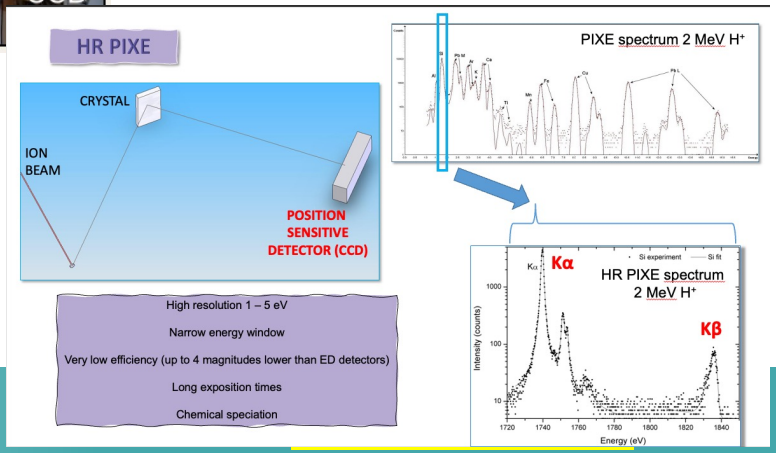
Study of chemical effects on HR PIXE spectra



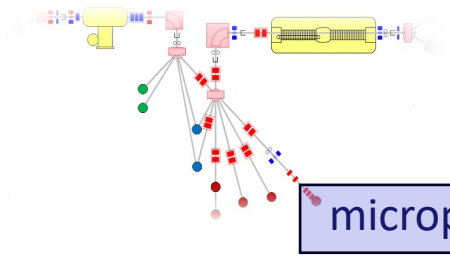


Chemical speciation studies

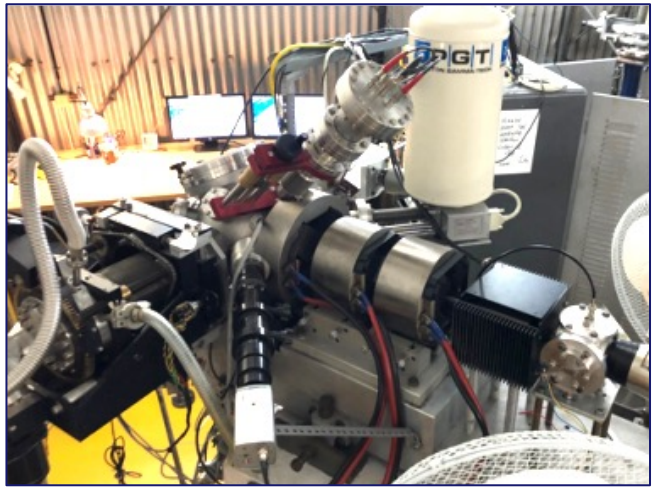
Multiple ionization satellites (MIS) studies

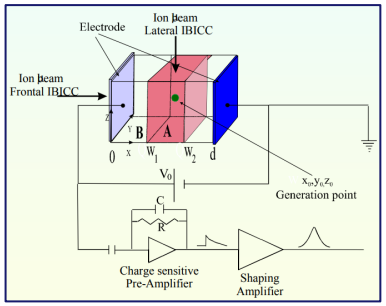


Task 4.2: Micro-beam upgrade at RBI accelerator facility



microprobe



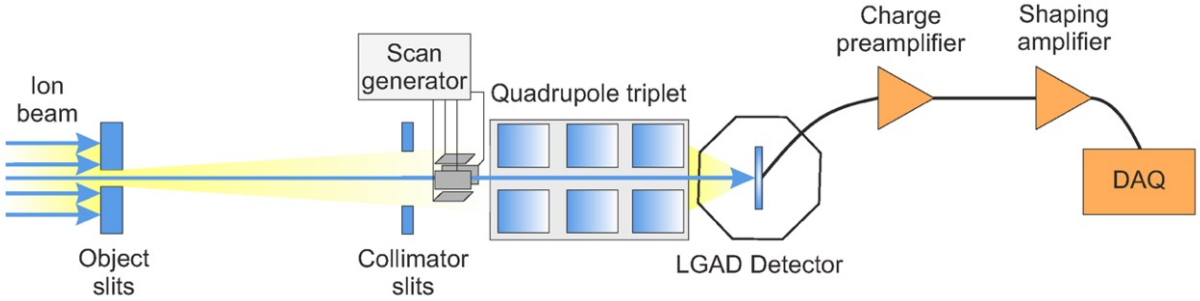


Activities at the microprobe (since 2nd Annual meeting)

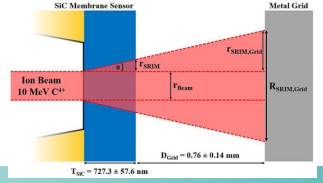
EURO-LABS
EUROPEAN LABORATORIES FOR ACCELERATOR BASED SCIENCES

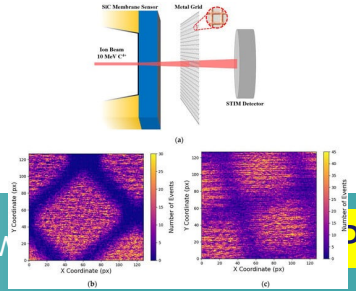
M. Jakšić, G. Provatas

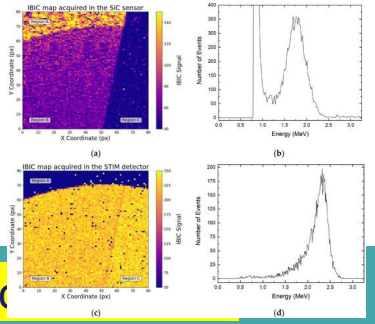
Detector characterization/testing by means of IBIC microscopy



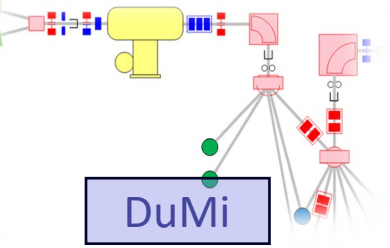
Study of SiC membranes for single ion detection







Task 4.2: Micro-beam upgrade at RBI accelerator facility



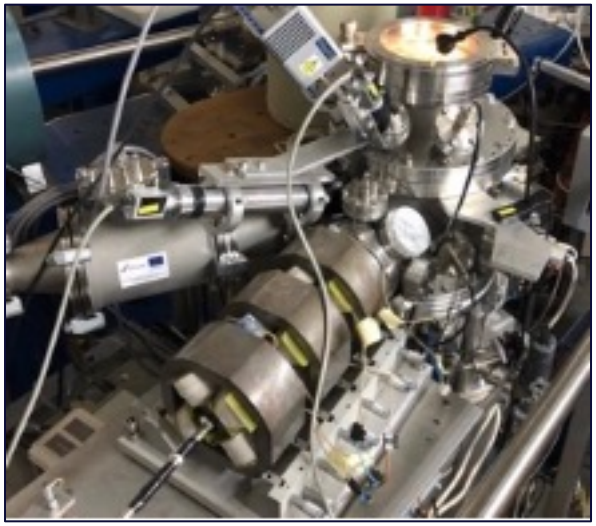
Activities at the microprobe (since 2nd Annual meeting)

IAEA

CERIC
Central European Research Infrastructure Consortium

EURO-LABS
EUROPEAN LABORATORIES FOR ACCELERATOR BASED SCIENCES

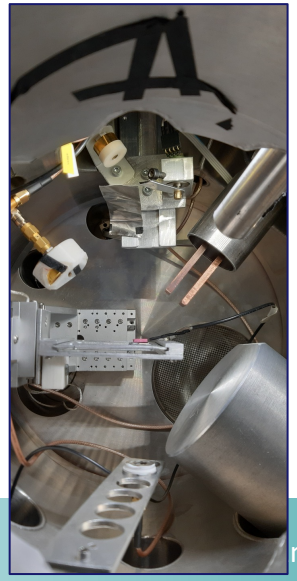
G. Provatas and all!

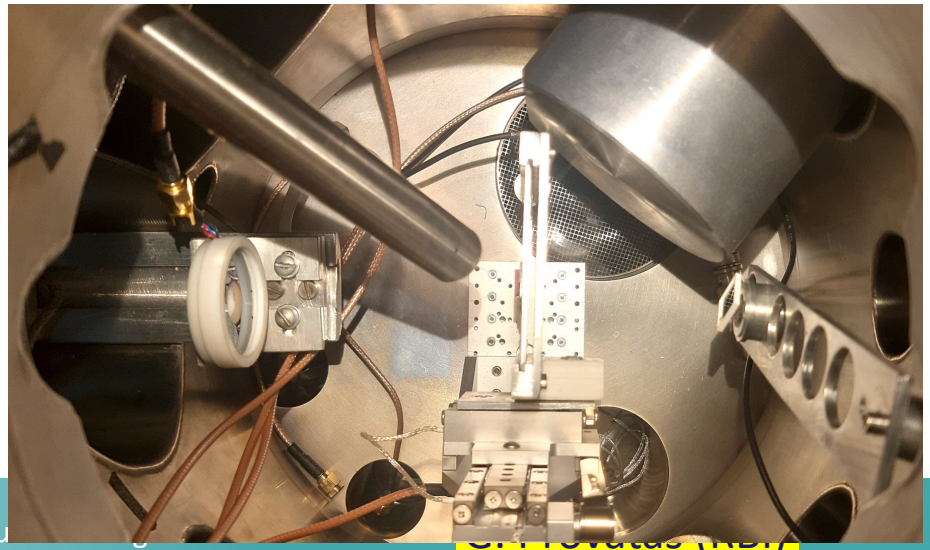


PIXE, RBS, IBIL, STIM, 3He-NRA, PIGE materials analyses

IBIC detectors characterization

precise irradiations



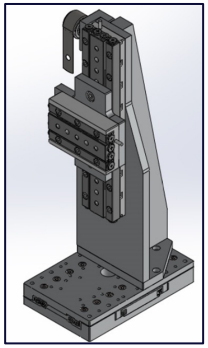


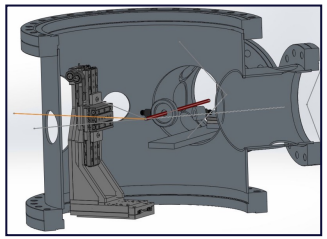
Task 4.2: Micro-beam upgrade at RBI accelerator facility

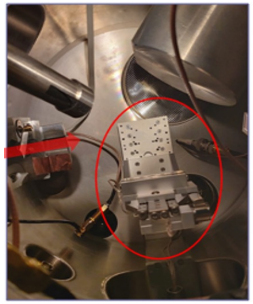
In the 2nd Annual meeting, the milestone M23 was summarized

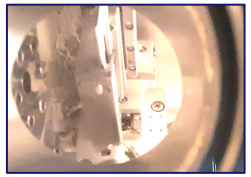
Task 4.2: Micro beam upgrade at RBI accelerator facility

- Upgrade the two existing ion micro-beam end stations
  - Upgrade of microprobes with precise target positioning systems
  - Sample cooling option for the old microprobe









AIDA innova Task 4.2: Micro-beam upgrade at RBI accelerator facility

Summary:

- ✓ ***Two precise motorized positioning*** *systems for long and short focus positions at the* ***DuMi*** *setup have been designed, related components procured assembled and tested.*
- ✓ *The existing home made data acquisition and control system* ***SPECTOR*** *has been* ***upgraded*** *to enable the control of the new piezoelectric motorized stage.*
- ✓ *Upgrade of the old microprobe with possibilities for sample cooling. Cryogenic and passive LN2 cooling have been installed and tested. Detectors can now be tested down to 38 K.*

Milestone M23 has been achieved

Future activities within Task 4.2:

- ➢ *Installation of precise target positioning system at the old microprobe*
- ➢ *Improvements of old microprobe cooling system for studies below 38 K.*

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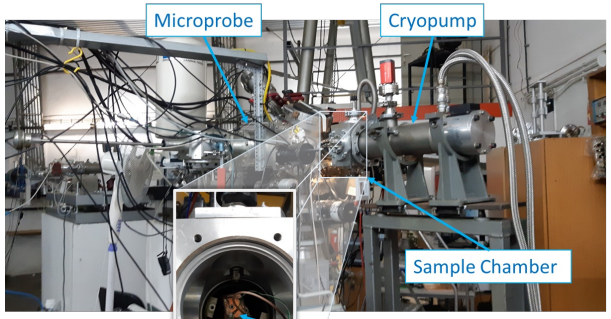
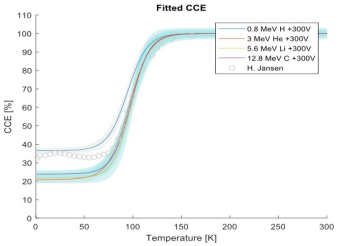


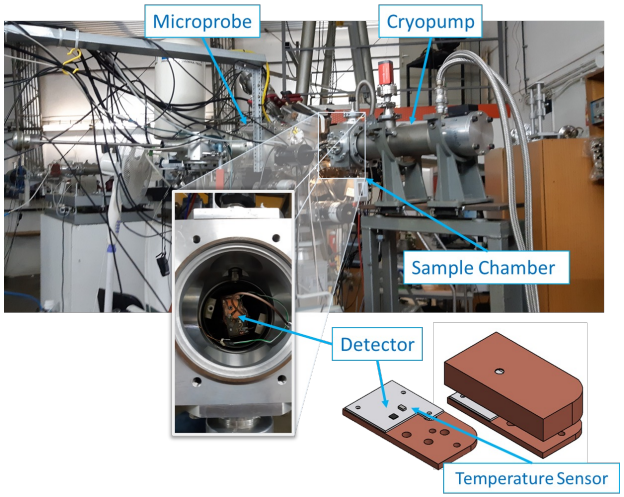


CCE drop significantly below 100 K

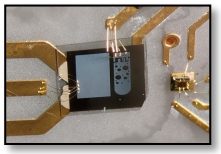
Task 4.2: Micro-beam upgrade at RBI accelerator facility

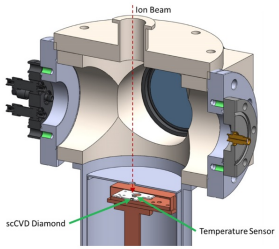
Systematic Study of scCVD detectors at low temperatures

K. Ivanković Nizić PhD Student



This time a 40 um thick scCVD was placed at the chamber for low temperature IBIC studies





IBIC probing down to 40 K with:

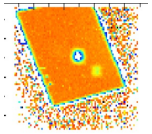
- 2 MeV and 3 MeV protons
- 12.8 MeV Carbon
- 3 MeV Helium

Study under low temperatures and extreme **irradiation** with a 3 MeV protons damaging beam

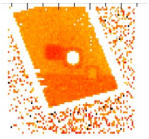
Ion beam Trancient Current Technique (**TCT**) with

- 5.6 MeV Lithium
- 3 MeV protons

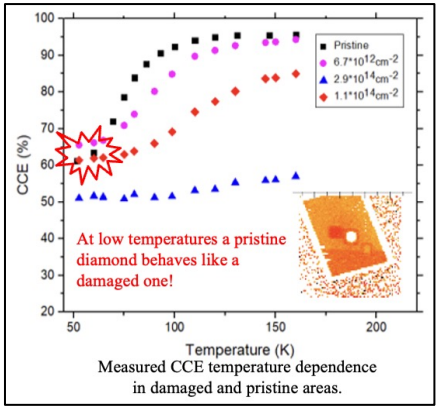
IBIC maps

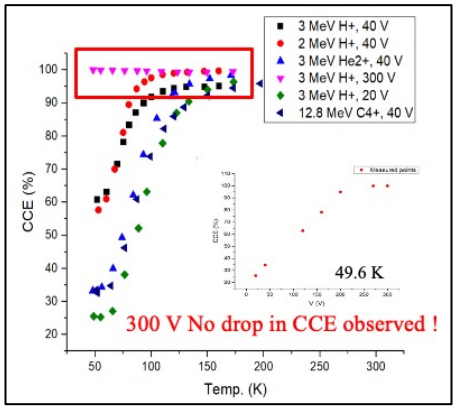


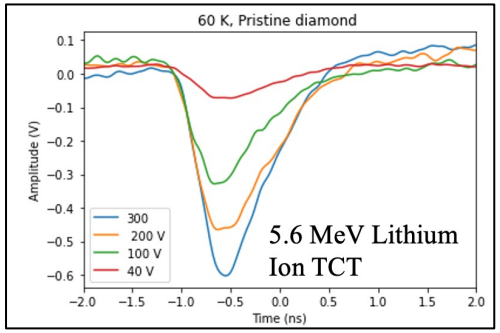
293 K



50 K





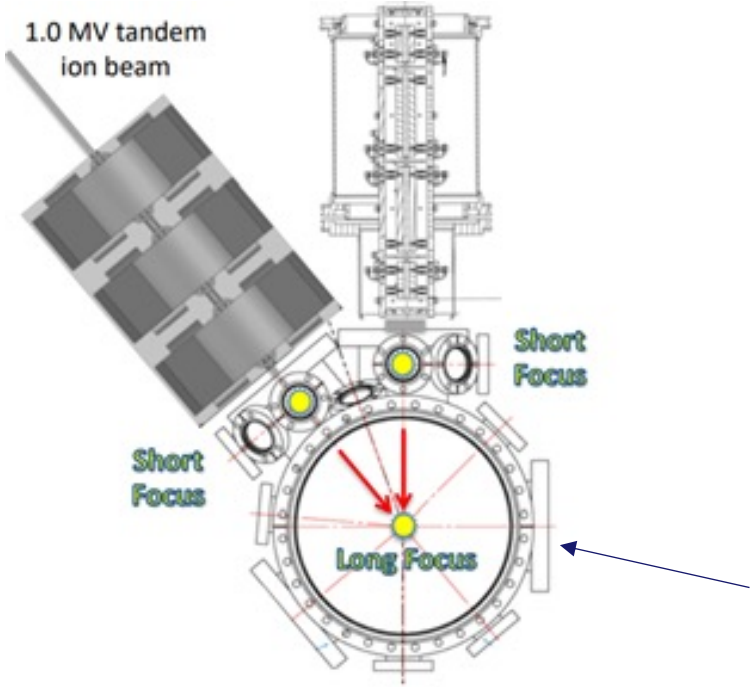


Already at voltages > 7.5 V/um the signal completely recovers to 100 % CCE!

Task 4.2: Micro-beam upgrade at RBI accelerator facility

The present setup for low temperatures can achieve temperatures ~ 40-50 K

Aiming for a more flexible setup and even lower temperatures a new setup is designed.



K. Ivanković Nizić PhD

Closed cycle cryostat

Cryostat minimum temperature < 9 K

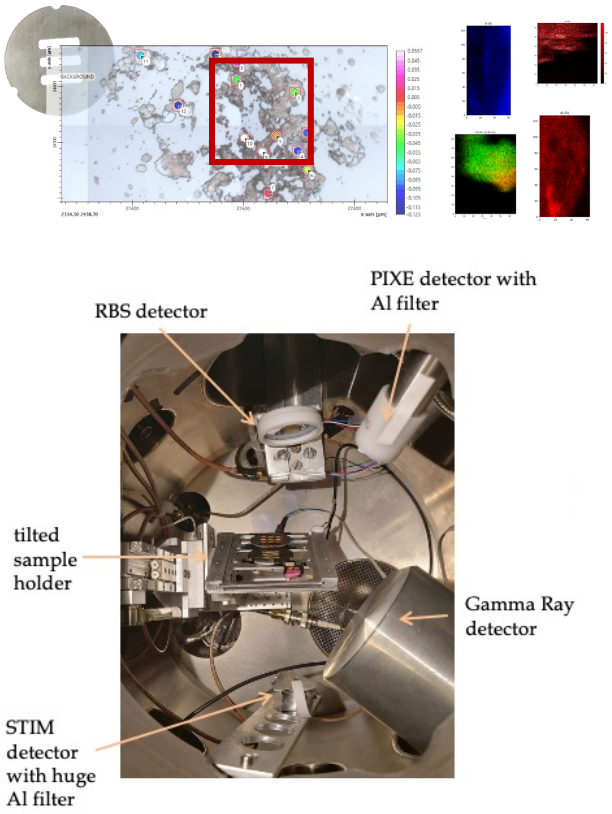
Heater will be also implemented in the setup

Extension to the cold tip for xyz manipulation

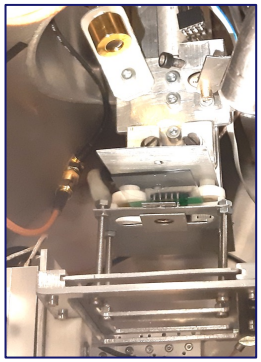
It will be mounted at the position of the PIGE detector at the DuMi setup (IBA+IBIC)

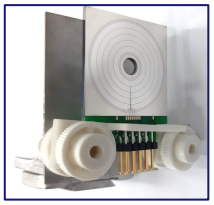
Task 4.2: Micro-beam upgrade at RBI accelerator facility

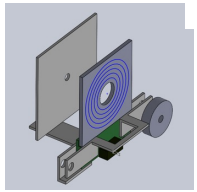
Time for sample precise positioning and micro-analyses on areas of interest is significantly decreased

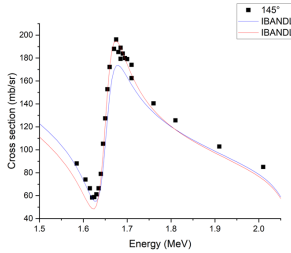


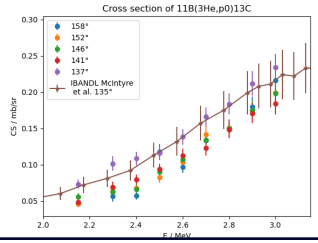
Well defined geometry can be obtained, enabling the measurement of 3He reactions cross section measurements.



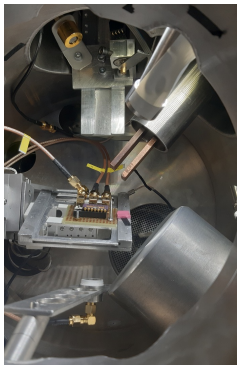




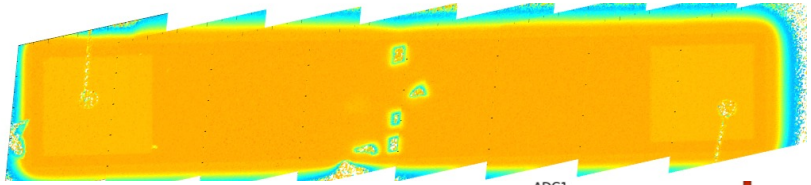


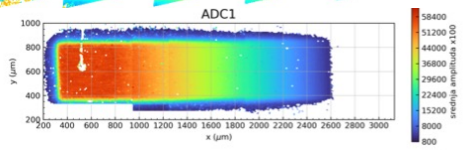


IBIC maps of detectors larger than the max beam scan size can be easily obtained.



Precise irradiations can be carried out at well defined detectors positions.

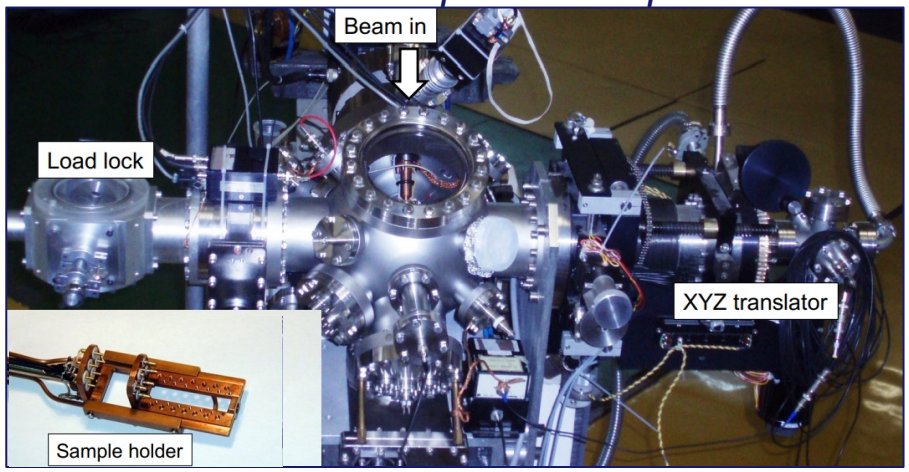


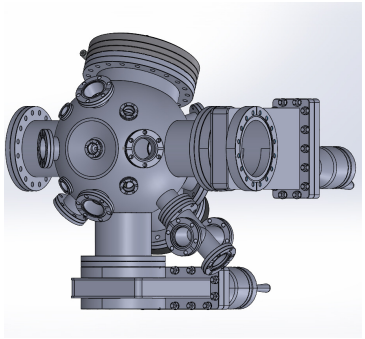


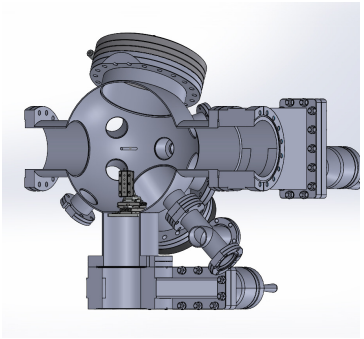
Patterning on position sensitive detectors.

Task 4.2: Micro-beam upgrade at RBI accelerator facility

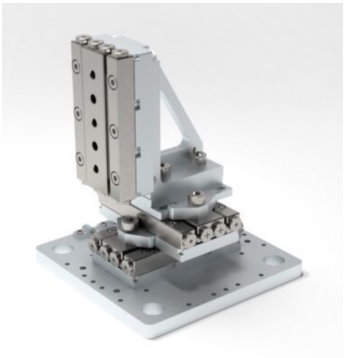
The RBI microprobe setup

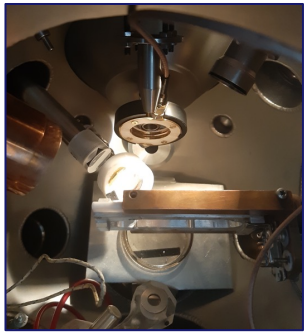






Degrees of Freedom	3
Stages used	SLC-2445
Travel [mm]	29 (X); 29 (Y); 29 (Z)
Payload [N]	1.5
	Closed-Loop
Sensor Resolution MCS2 [nm]	1 (S)





Currently, the sample is manually positioned

Using micromanipulators attached to an

XYZ translator

A new XYZ piezo stage has been purchased and is in delivery.

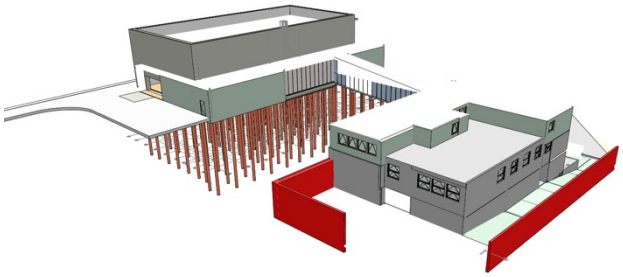
The stage has 29 mm travel range and nm resolution.

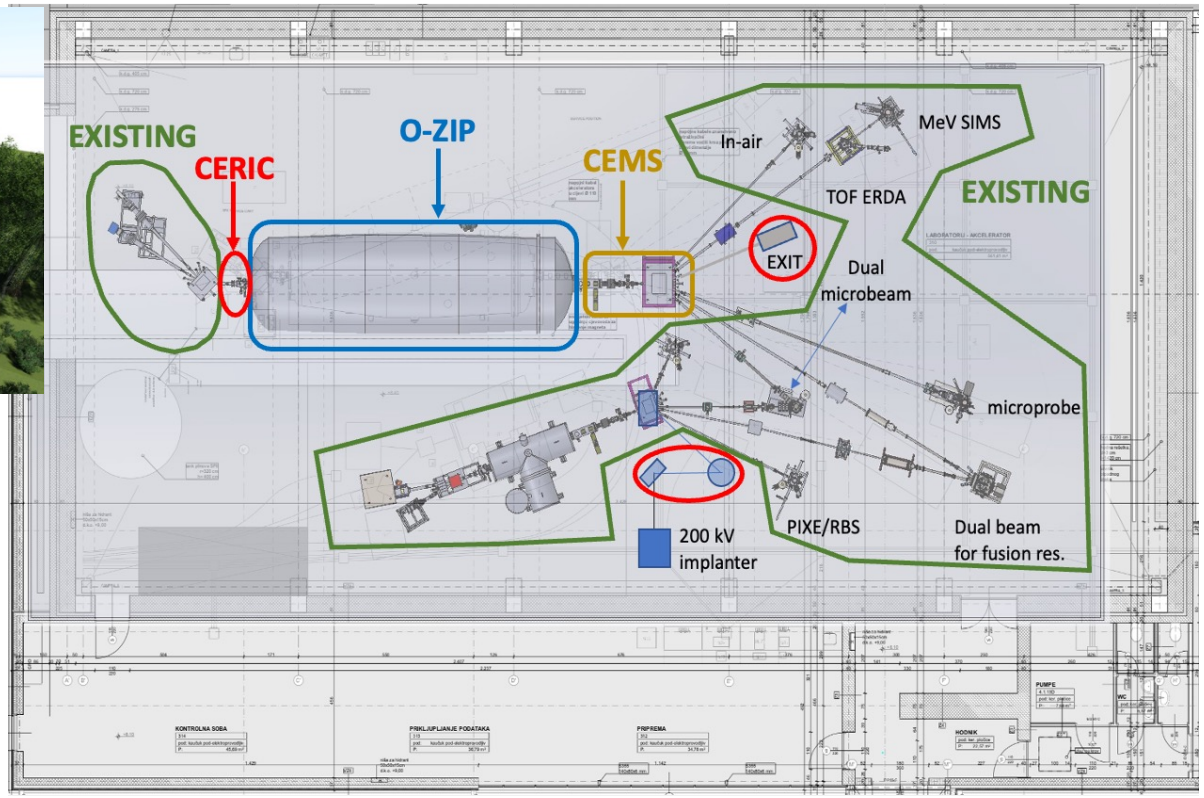
A target holder will be designed and mounted to the stage.

Appropriate software for control will be made and incorporated to RBI's in-house DAQ, SPECTOR.

Task 4.2: Micro-beam upgrade at RBI accelerator facility

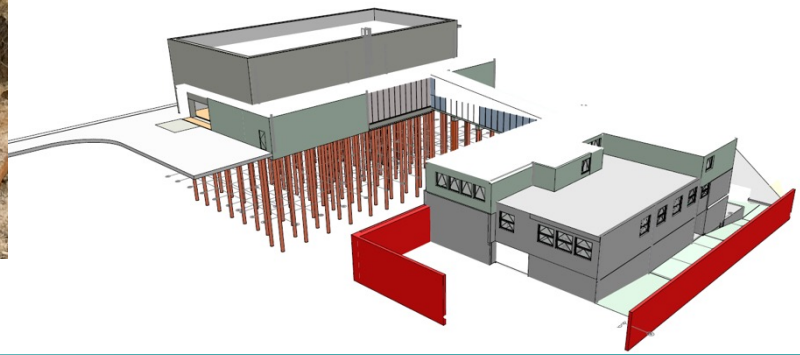
The future of the lab





Task 4.2: Micro-beam upgrade at RBI accelerator facility

Not so far in the future. We are moving in October 2024!



Task 4.2: Micro-beam upgrade at RBI accelerator facility

Thank you!

G. Provatas, S. Fazinić, I. Božičević Mihalić, D. Cosic , M. Vićentijević, K. Ivanković Nizić, Z. Siketić and M. Jakšić