RBI activities in 2021: ERDA and PIXE characterization of selected Be and W reference samples – plans and capabilities

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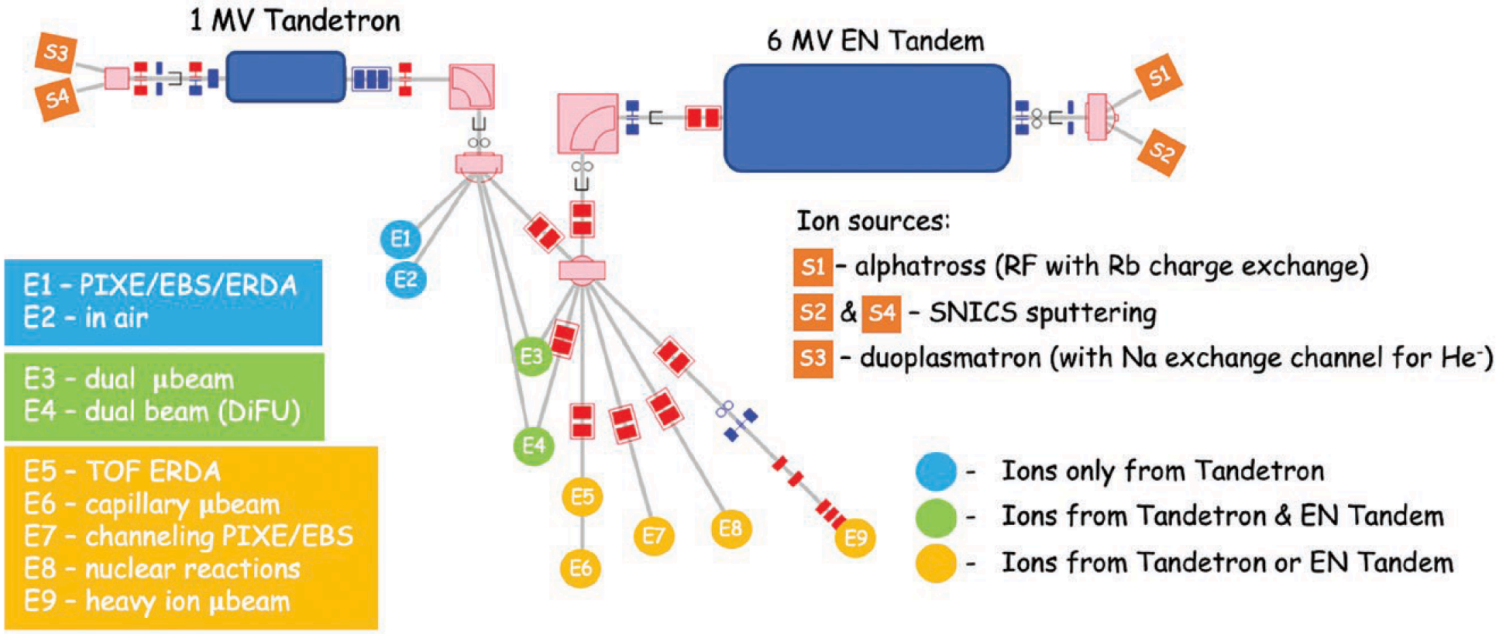
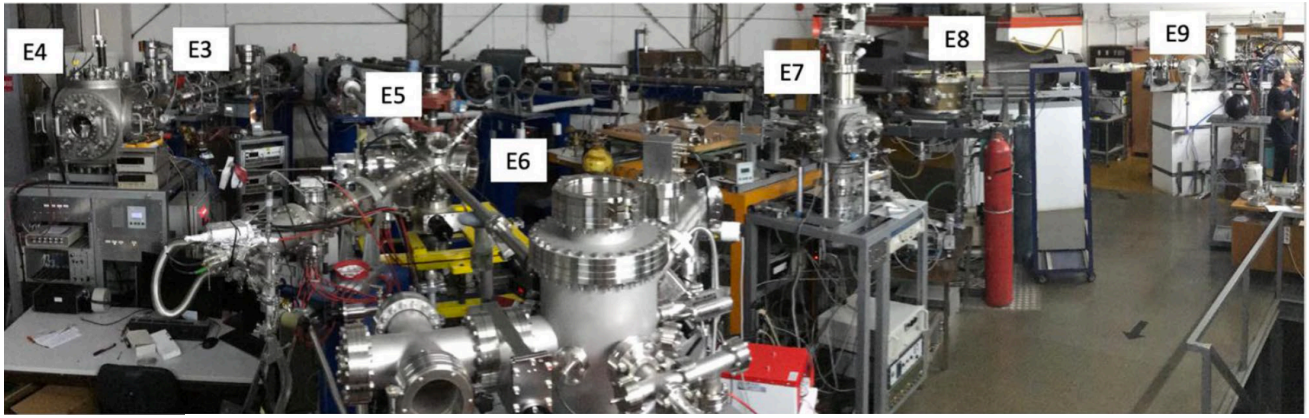
Tasks to be performed:

- Compositional characterization (broad-beam and microbeam) of the produced Be and W reference layers

- D7 - ERDA and PIXE characterization of selected Be and W reference samples

RBI facility

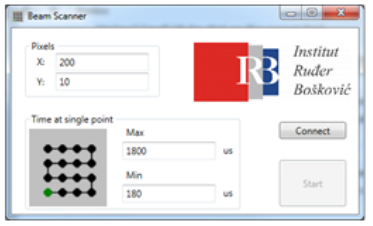




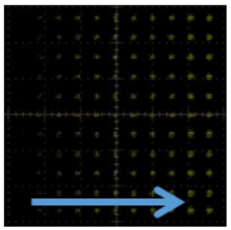
https://doi.org/10.1080/10619127.2020.1752087

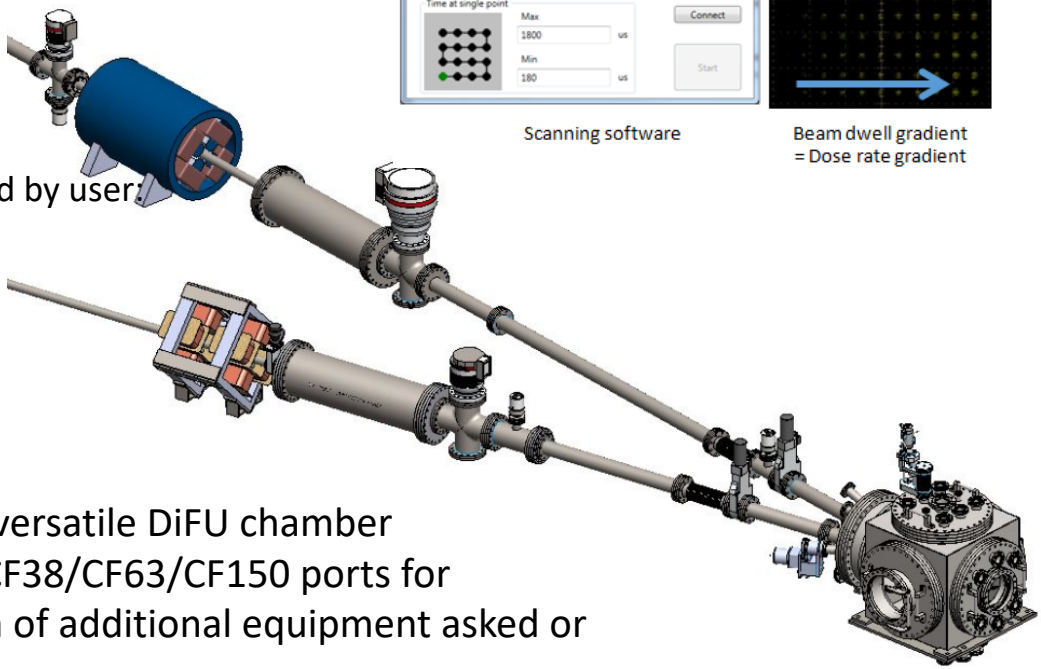
Single and dual beam ion irradiation at the RBI's Dual-beam Facility DiFU

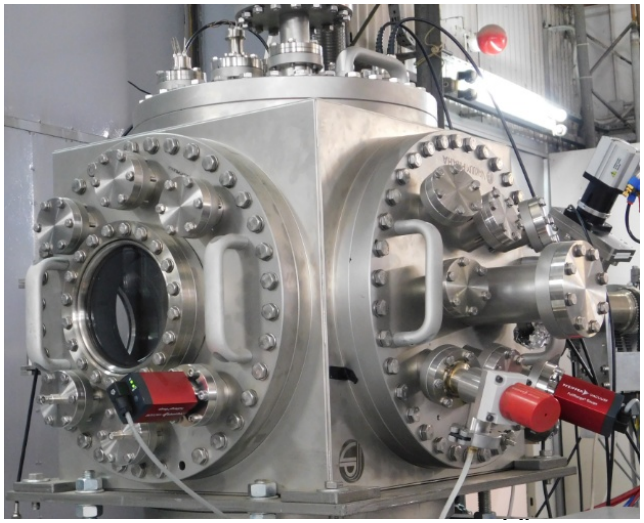
- Ion irradiation of samples on area 5x5 – 30x30 mm2, by one or two ion beams & **High-frequency scanning (up to 10kHz);**
- Digital scanning & **Dose-gradient scanning**
- Indirect ion beam flux measurement, with constant ion flux monitoring by slits;
- Adjusting of ion beams' energy spectra by rotational foil degraders;
- Sample positioning using sample XYZ manipulator;
- Sample heating & control of sample temperature by IR camera and TCs;
- Mitigation of carbon deposition by:
  - Installation of Plasma Cleaner
  - LN2 Cold trap in front of irradiated sample
- Adapter for small (heated) samples
- Installation of additional equipment provided / asked by user:
  - gas injection,
  - active cooling of samples, etc.



Scanning software


Beam dwell gradient
= Dose rate gradient





Large and versatile DiFU chamber with free CF38/CF63/CF150 ports for installation of additional equipment asked or brought by users

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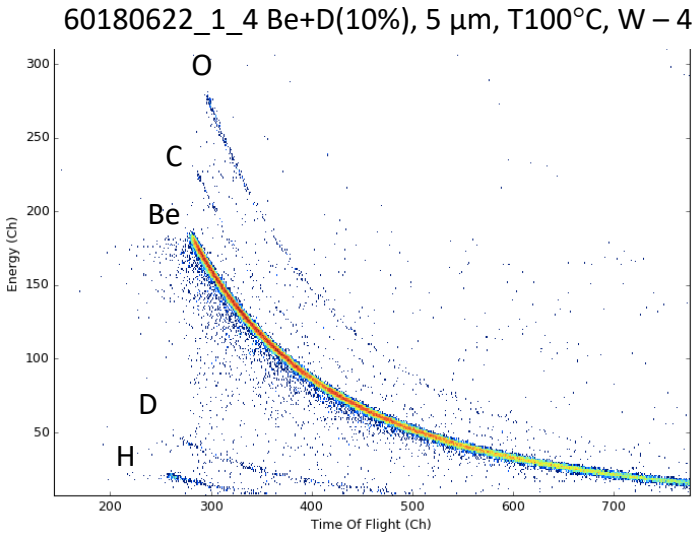
ToF ERDA

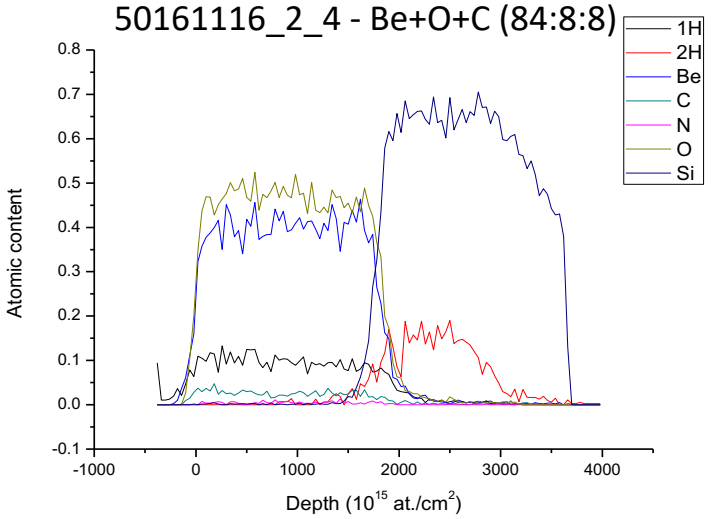
- for samples containing heavy elements, like W, TOF-ERDA can measure concentrations and depth profiles of elements in first 100-200 nm

- for samples containing light elements, like Be, TOF-ERDA can measure concentrations and depth profiles of elements in first 300-500 nm



- Mass resolution is better than 1 for M < 40

- TOF ERDA is usually done using 20-23 MeV iodine beam under a scattering angle of 37.5°



Method is not appropriate in case of pronounced surface roughness

Measurements performed in 2021

- ToF ERDA - set of samples from E.Grigore

Sample	H at.%	D at.%	C at.%	N at.%	O at.%	Ar at.%	W+Ta at.%
EU2-58-12	1.3±0.3	3.2±0.9	1.4±0.2	13±1	15±1	1.1±0.2	65±4
EU2-59-11	1.7±0.4	7±1	0.5±0.2	6.5±0.7	31±2	1.1±0.3	50±3
Sample	**H at.%**	**D at.%**	**C at.%**	**N at.%**	**O at.%**	**Ar at.%**	**W at.%**
EU2-62-15	2.0±0.5	9±2	1.4±0.3	22±1	18.6±2	0.9±0.2	45±2
EU2-63-16	2.0±0.4	10±1	1.1±0.2	13.5±1	27±1	1.1±0.2	44±2
EU 924-7	1.2±0.4	-	1.0±0.3	3.6±0.5	0.9±0.3	0.6±0.2	92±5

RBS on HiperFer and CroFer samples by RBS

- RBS - set of samples from F. Ghezzi
- 2 MeV He^{2+}, scattering angle 165°