South East European
International Institute
for Sustainable Technologies

Sarajevo Linac Project

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SEEIIST-NIMMS weekly meeting, October 30, 2020

The project

- A private founder (Eddy Offerman) wishes to contribute to development of University of Sarajevo.
- The idea is to fund a lab with modern equipment, which could be used for SEEIIST project, but would also have other (scientific) uses.

- In addition a 5-year scientific position at University of Sarajevo is offered (looking for candidates).
- (Eddy already supported students from Sarajevo to come to CERN for summers)

The project resources

- The senior scientific position (key asset, start date - unknown).
- Positions for two students dedicated to the project (Fehima and Benjamin since October 1st).
- The lab space (discussions ongoing with University).
- The equipment (discussions with companies started).
- CERN team: Yiota, Elena, Mariusz.
- Aris for radioisotope production.

Where we are

- The preliminary project description has been written.
- Benjamin and Fehima started, we are having 2 meetings per week.
- Google drive with presentation and documents
  - managed by Benjamin and Fehima.
- Contacted companies (highvolteng.com, dreebit - contact via Peter Gruebling, i-tech) and institutes (CNAO, many thanks to Marco Pullia, Josef Stefan Institute).
- Comparison of relevant ion sources.
- Definition of the project scope(s).

Comparison of sources

Part of the source comparison table by Benjamin (could be presented in detail at next meeting).

Tabel comparison of ion soruces.xlsx — Open with

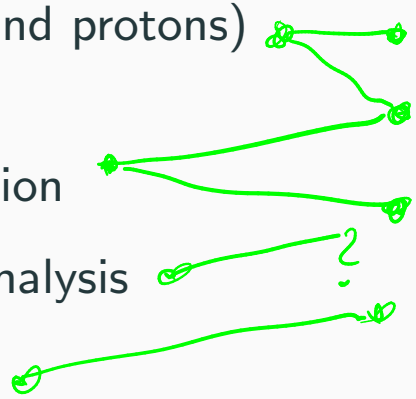
	Supernanogan (Pantechnik)	ECR (DREEIBIT)	Duoplasmatron (HVEE)	EBIS-SC (pulse source)
General information				
Size	2.5*3.5 m (Pantechnik Supernanogan)	460 mm * 340 mm	Not that important but less then supernanogan since the supernanogan from Pantechnik since he comes with a entire turn-key bench	640 mm x 400 mm x 605 mm
Weight	220 kg (permanent magnets), 300kg (lead shielding)	35kg (only the source)	Less since there are no magnets and lead shielding	125kg with magnets
Electronics at high voltages	NO		YES	NA
Lifetime	Not disclosed, only shutdowns when magnets are being upgraded		>1000 h fillament lifetime with hydrogen	NA (by looking into papers the same as with Supernanogan due to it's magnets)
Price	around 300k Euros		around 160k Euros	Waiting for an answer fromm DREEBIT
Support equipment				
Vacuum	The pressure at injection in the source should be around 10^-7 mbar and it should be around 10^-8 at extraction. We use Pfeiffer pumps and coming to pumping speed, we need 70 l/s at injection and about 1200-1400 l/s at extraction. The extraction pumping is provided with 2 pumps, half of the size each.	5 · 10−8 mbar (1 · 10−5 mbar with working gas)	Ultra high vacuum	Ultra high vacuum (10^-8 mbar and better)
Cooling	20°C water flow of 200 l/h at 2-3 bar	Air cooled, no cooling water required	Sylltherm XLT or equivalent fluids of 120 l/h flow and resitivity >1MΩ/cm	two deionized circuits, 90 l/h at 3 bar each
Gas consumption	one 2 l – 200 atm bottle per year for protons and one 2 l – 60 atm CO2 bottle and one 2 l -200 atm bottle of He every third year.		25 atm cc/h with 0.025 inch aperture	NA
Voltage platform	Not needed		Source must be insulated from (terminal) ground. The source power supplies must be connected to a 30kV isolation transformer	20 kV
Beam characteristics				
Normalised beam emittance	0.75π mm*mrad (for both C and H)		(0.02....0.025) mm mrad and 0.05 mm mrad	
RMS emittance			<2, <6 π mm mrad for positive and negative respectivly	rms-emittance is e x,rms = 33.5±6.6 mm mrad, e y,rms = 31.7±6.0 mm mrad

Project scope

Possible paths:

primary goal, secondary (backup) goal, corresponding source

1. SEEIIST injector (C4+ and protons)
2. SEEIIST injector and radioisotope production
3. Low Energy Ion Beam Analysis
4. R&D of EBIS injector
5. ...

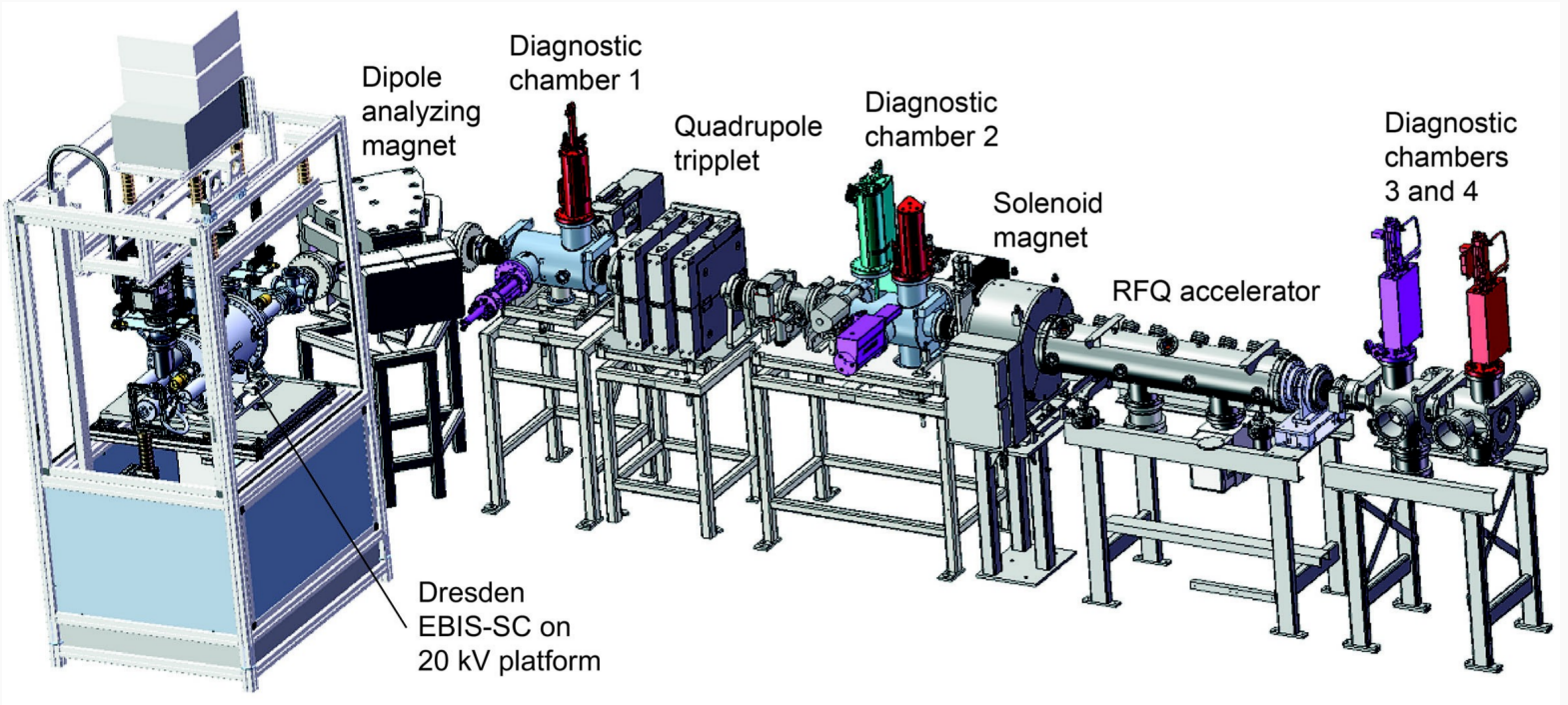


1. Standard ECR source
2. High Intensity ECR (Catania)
3. Duoplasmotron
4. EBIS
5. ...

The discussion is open.

Fehima could present her findings in 2 weeks.

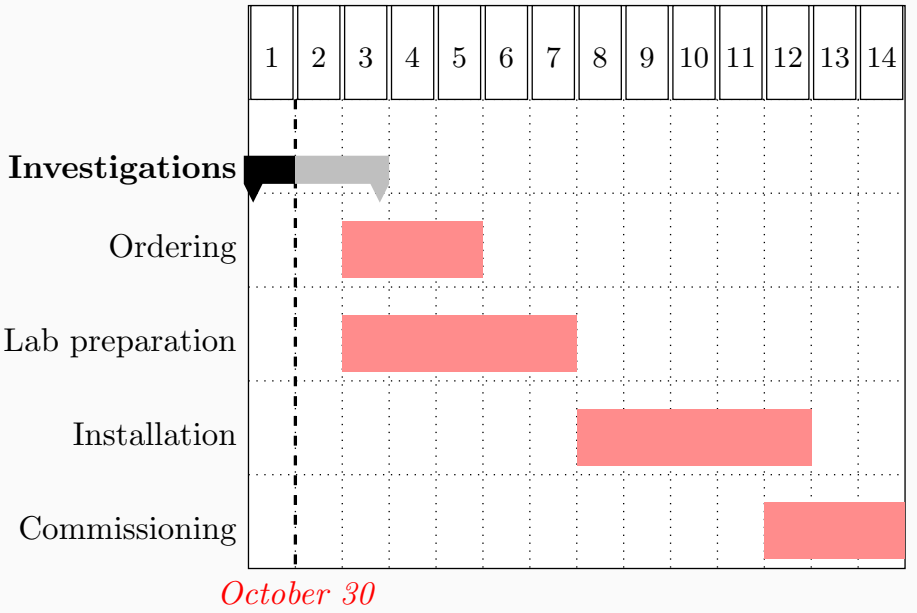
Possible layout



The master plan

Phase one:

- ion source and LEBT.
- start: October 1st, 2020.
- end: December 31st, 2021.



Second phase (if it is going to happen) should be defined at the beginning of 2021, because realization takes more time.

Summary

- Started, two bright students work on project definition and hardware specification.
- Discussion with University concerning lab space planned next week.
- Issue: lack of responsible person at the University.
- Source ordering must start soon as it takes up to several months to get it.
- Beam commissioning by the end of 2021.