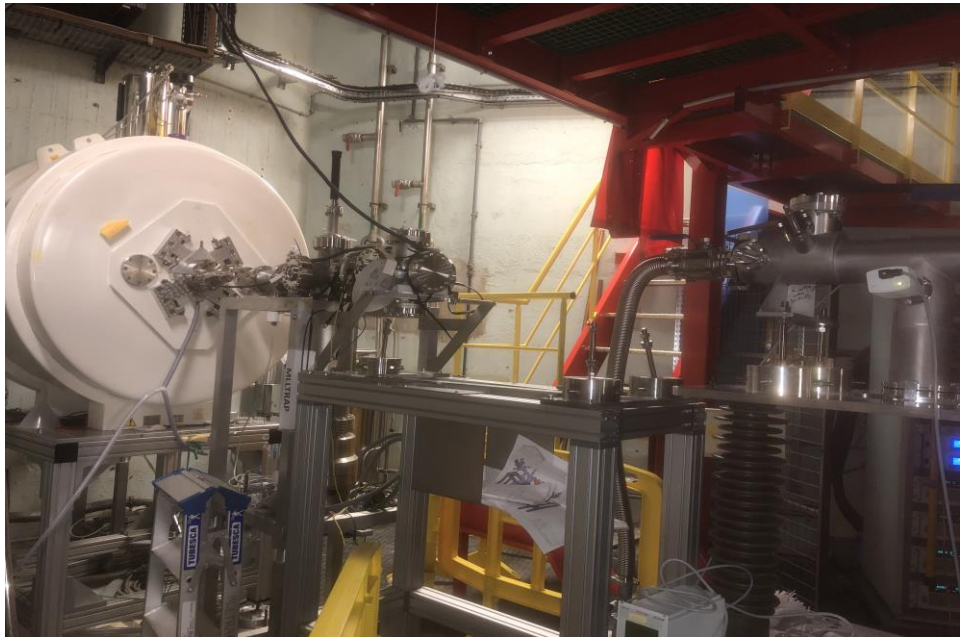
MLLTRAP experiment at ALTO-LEB



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I. Statuts of MLLTRAP

II. Transport calculations

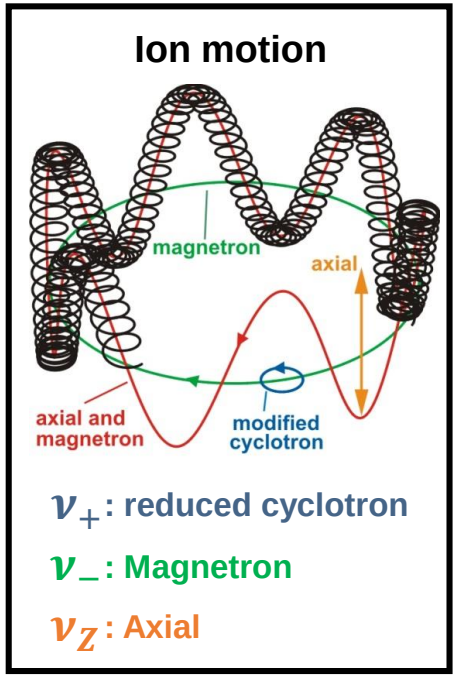
MLLTRAP : Maier-Leibnitzen Laboratory Trap

Double Penning trap spectrometer

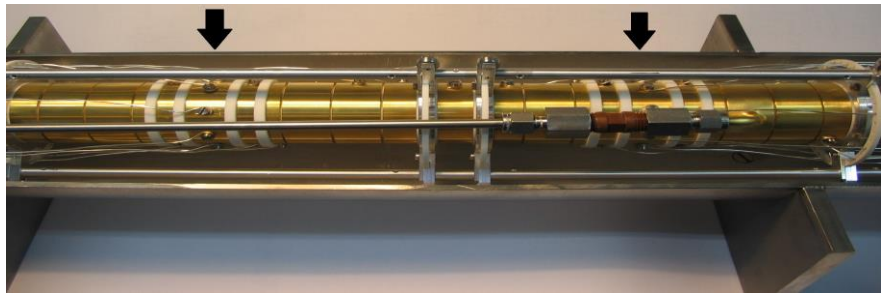
- Penning trap : superposition of high magnetic field and low electrostatic field to confine in 3D
- Preparation trap : Isobaric separation with buffer gas cooling
- Measurement trap : Cyclotron frequency measurements

7T superconducting magnet

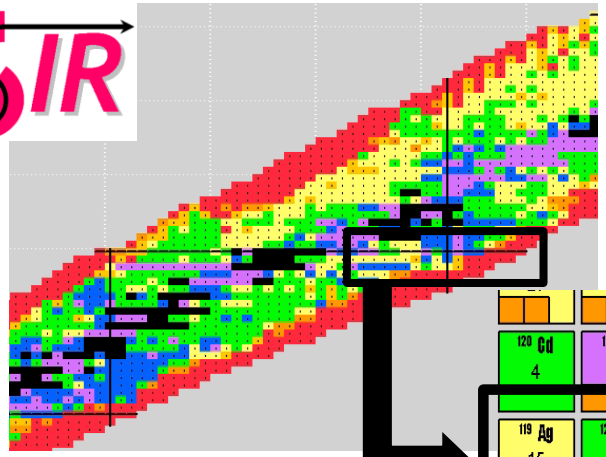
$$\nu_c = \frac{qB}{2\pi \boldsymbol{m}}$$



Measurement trap Preparation trap

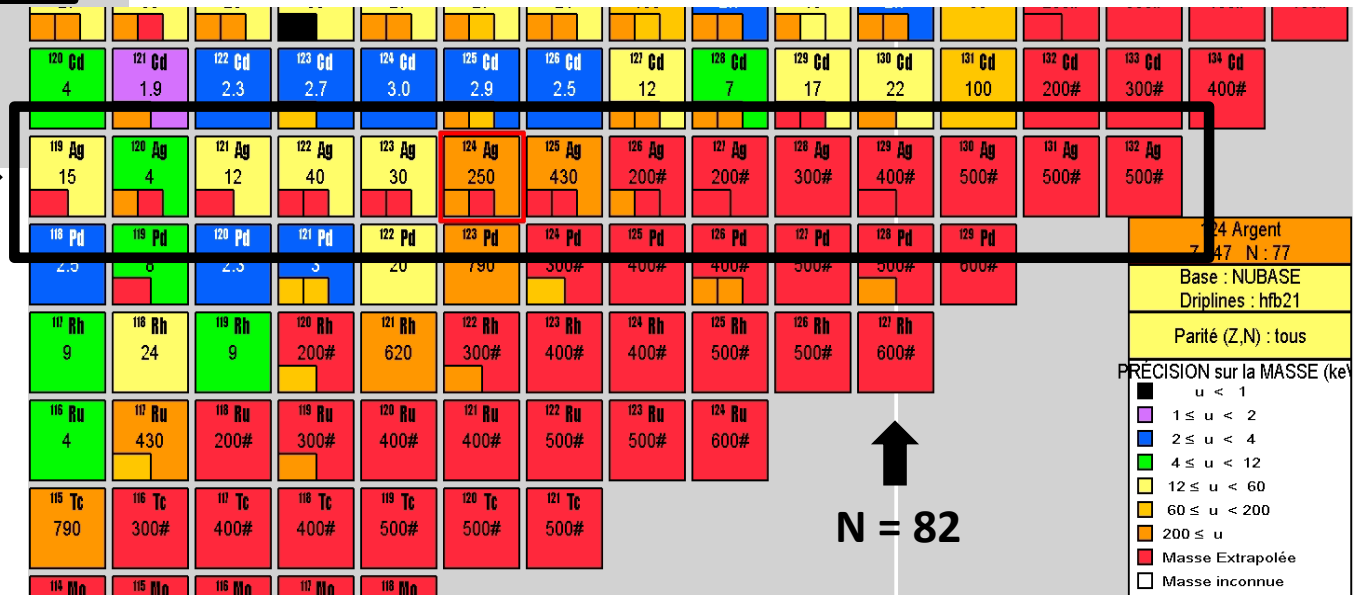


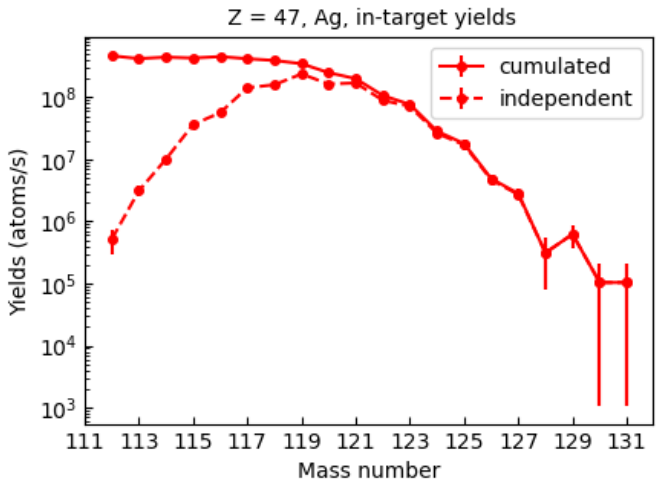
MLLTRAP – Physical case at ALTO-LEB



Study of Silver isotopes :

- N = 82 shell closure
- Access to binding energy
- Better understanding of nuclear structure





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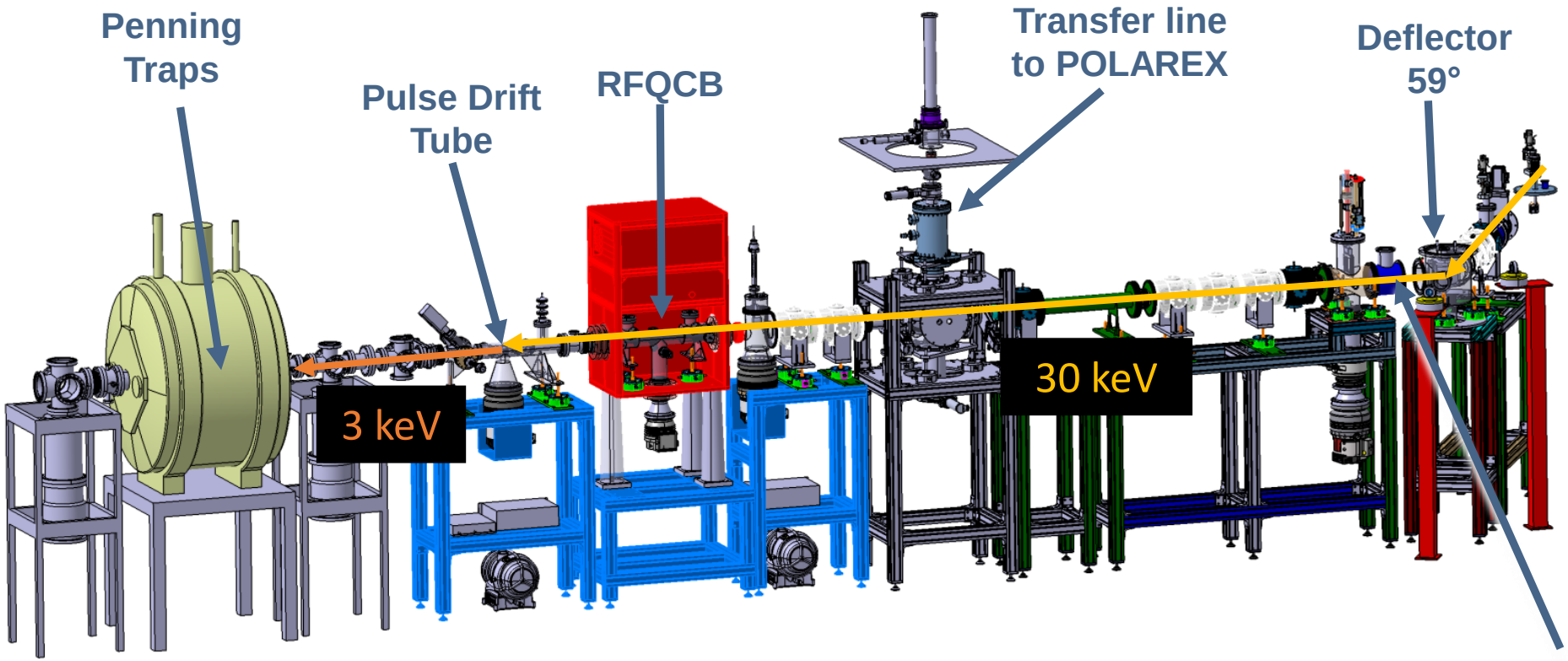
Production of Silver atoms at ALTO-LEB

MLLTRAP – Transfer Line



Conditions for mass measurements to be possible :

MLLTRAP : small emittance, small energy (~ hundreds of eV)

↳ RFQCB : beam parallel at its entrance

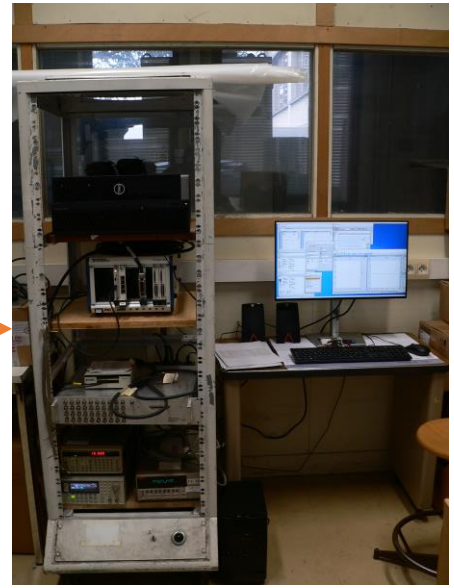
RFQCB

- RFQCB installed at ALTO-LEB in February 2023
- Primary vaccum test : $4{,}8.10^{-3}$ mbar + leak test at 10^{-10} level
- Aligned
- Still not connected to the beamline
- Comissioning during Spring 2023

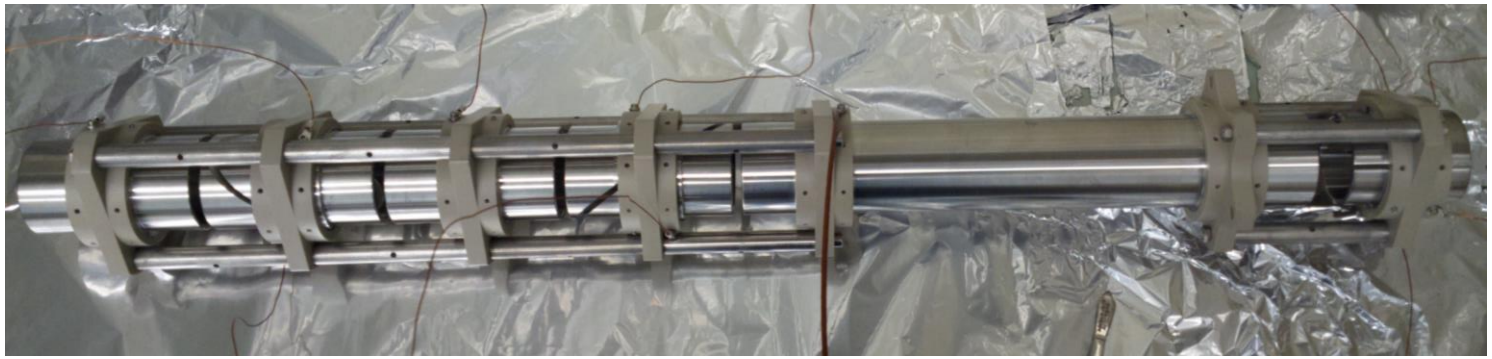
Provisional diagnostic chamber for emittancemeter

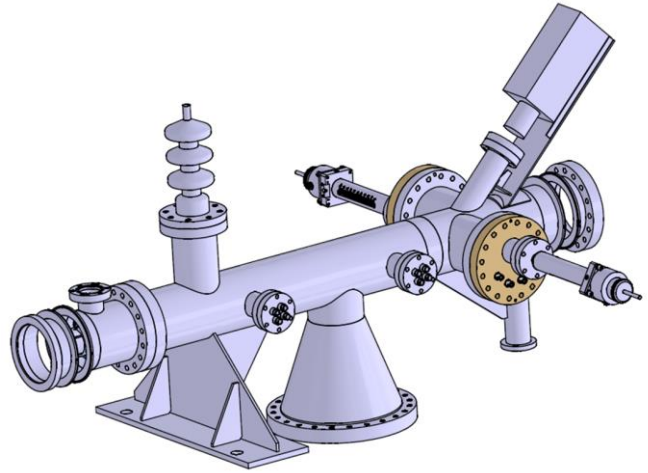
RF-Drive

CS Computer



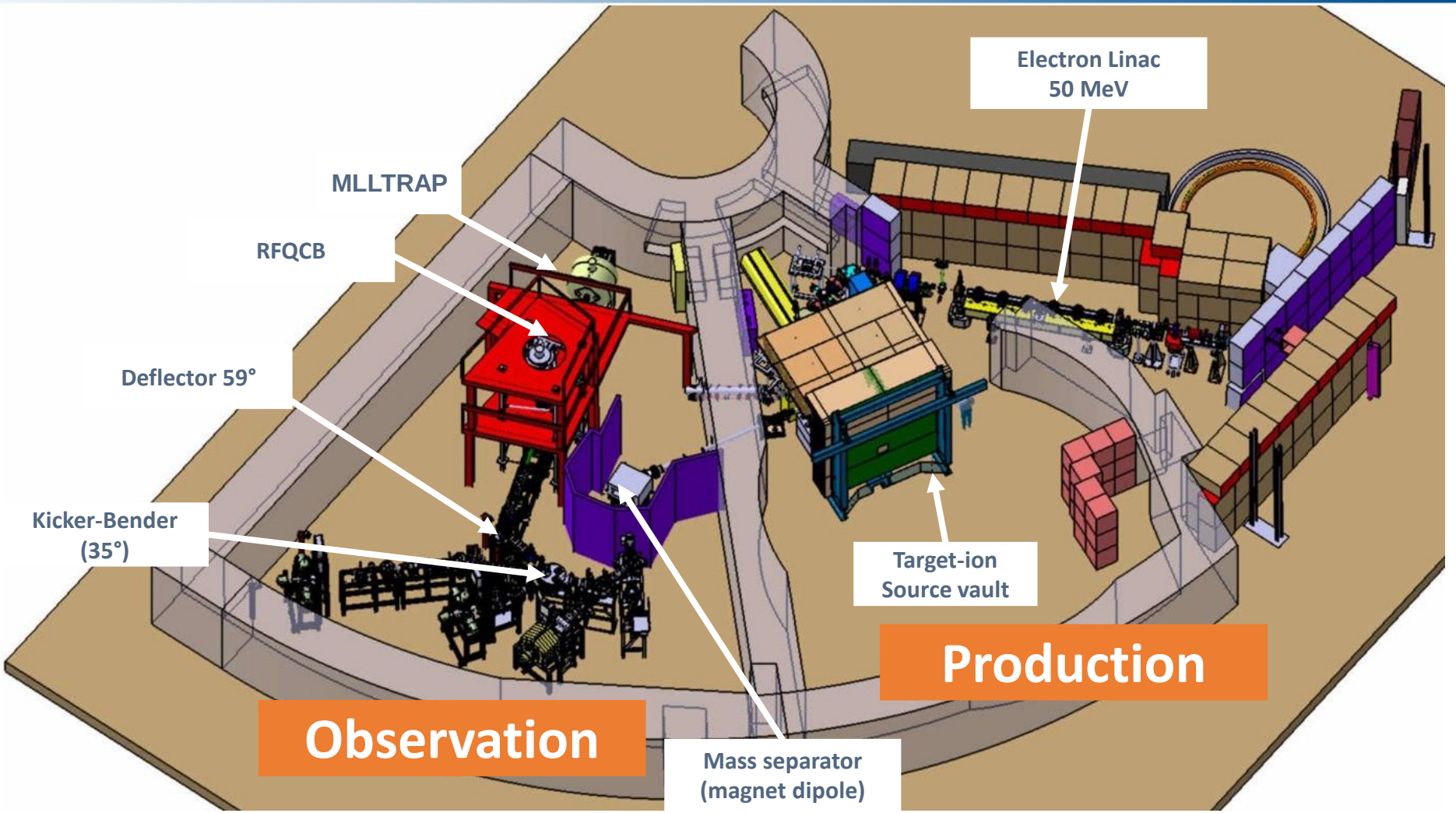
Pulse Drift Tube



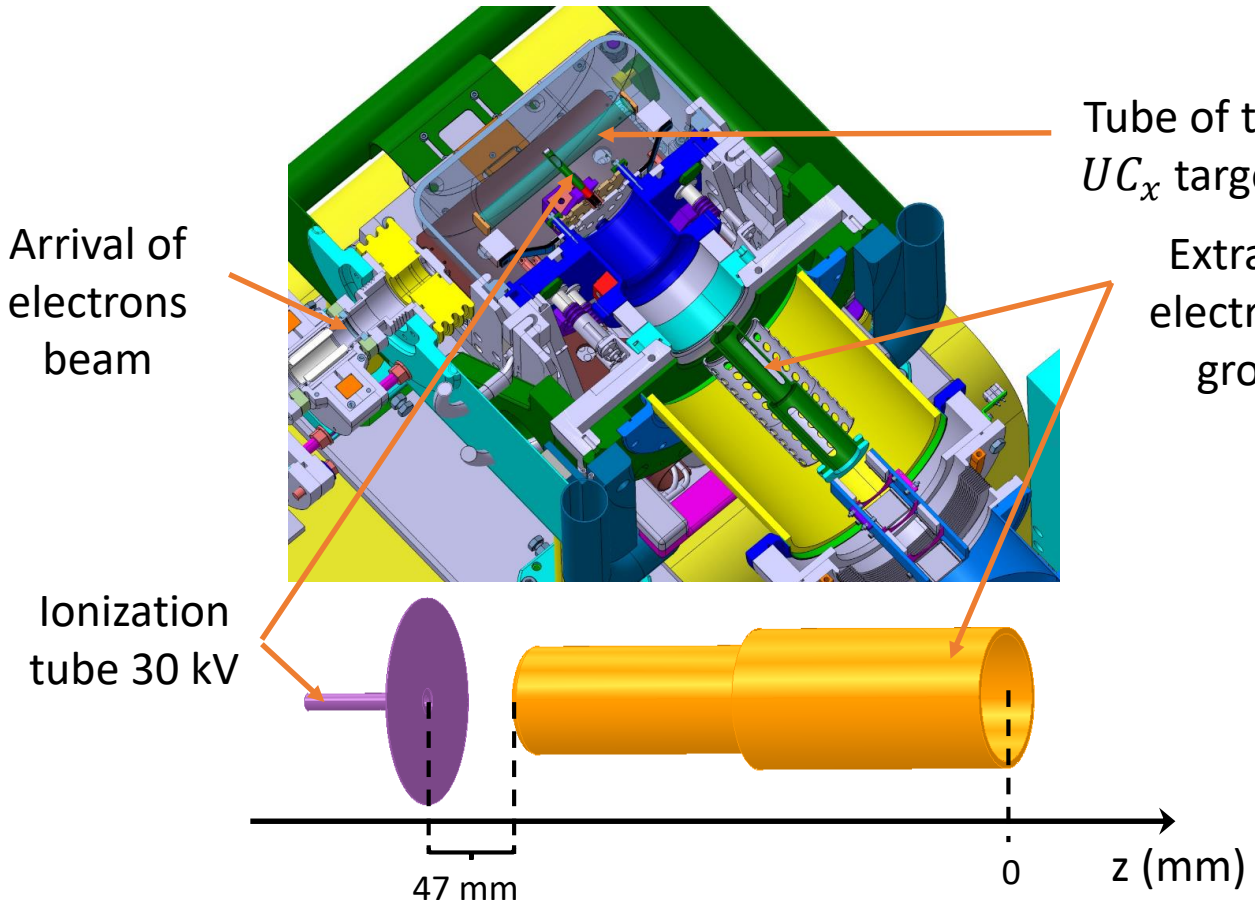


- Still in preparation
- Cables connected
- Ready to be inserted in vacuum chamber
- All electronics and diagnostics delivered
- Primary vaccum test and installation at ALTO-LEB planned during Spring 2023

ALTO-LEB : Accélérateur Linéaire & Tandem d'Orsay – Low Energy Beam



Beam transport simulation : Beam parameters from target-ion source vault



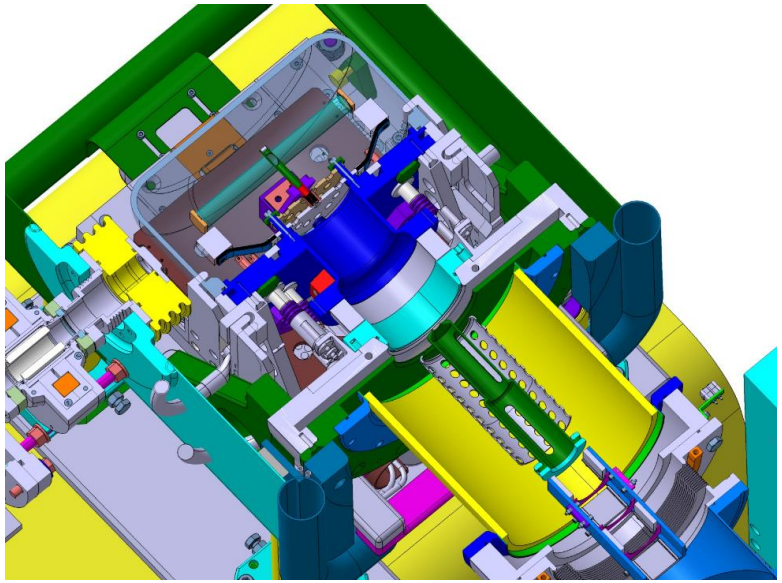
Radioactive ion beam production at ALTO-LEB :

- Electrons beam (50 MeV) for photofission
- Laser Ionization

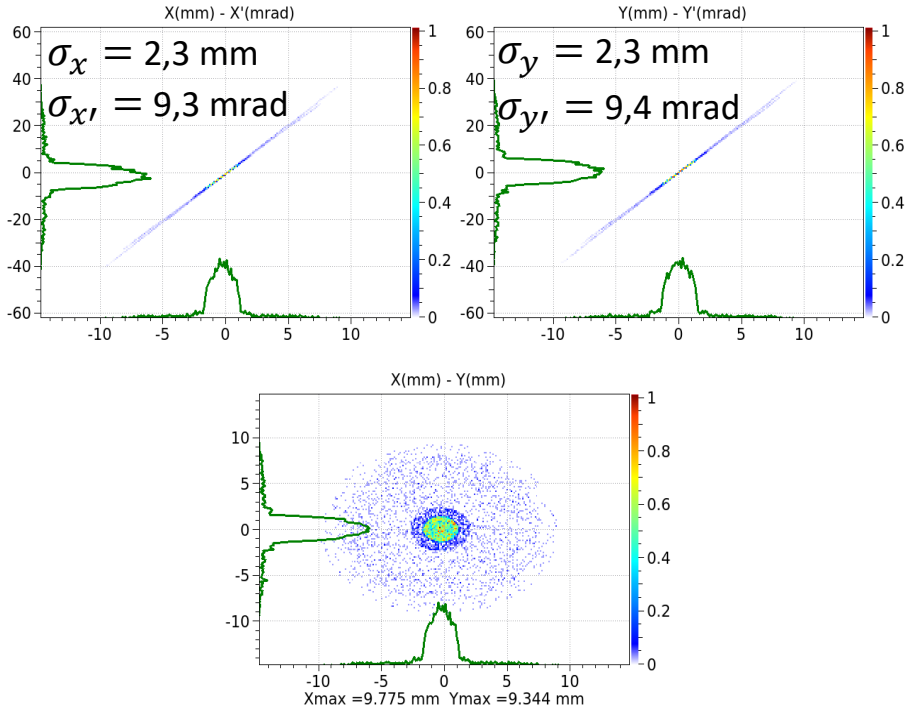
Simulation of extraction with Opera

- Careful optimisation
- Particles tracking

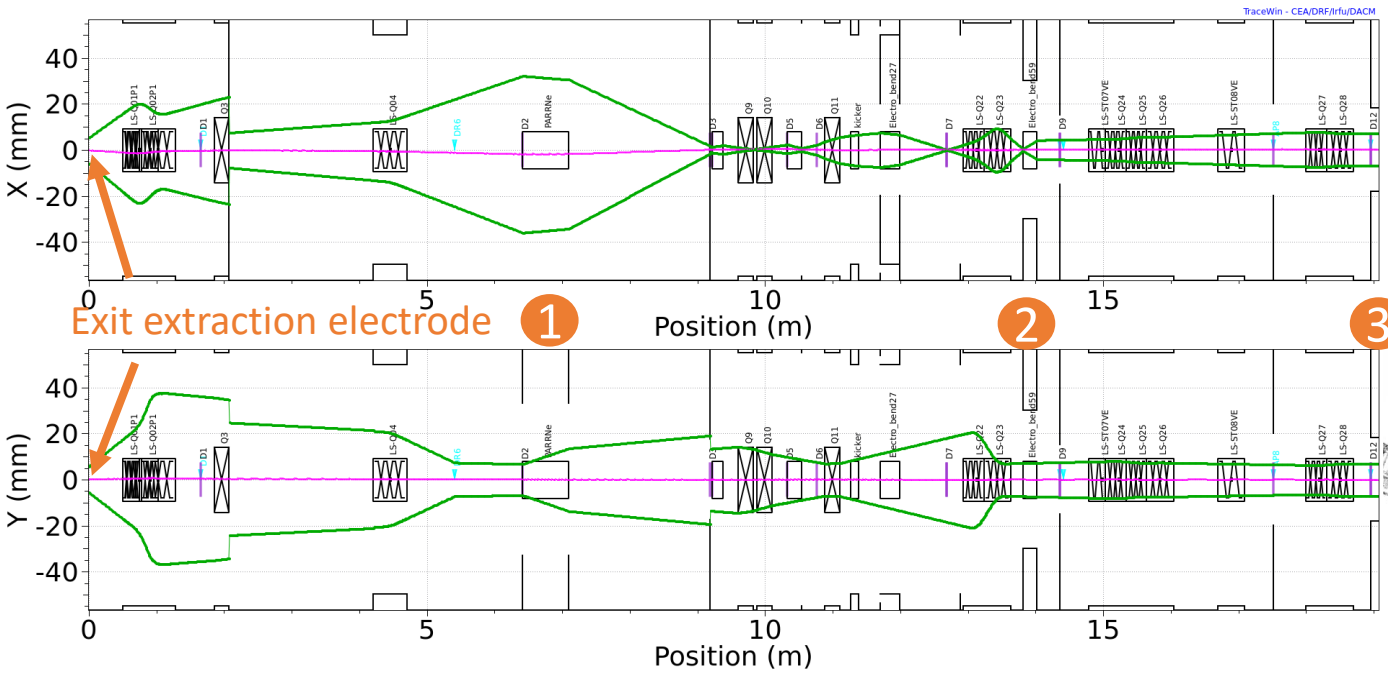
Beam transport simulation : Beam parameters from target-ion source vault

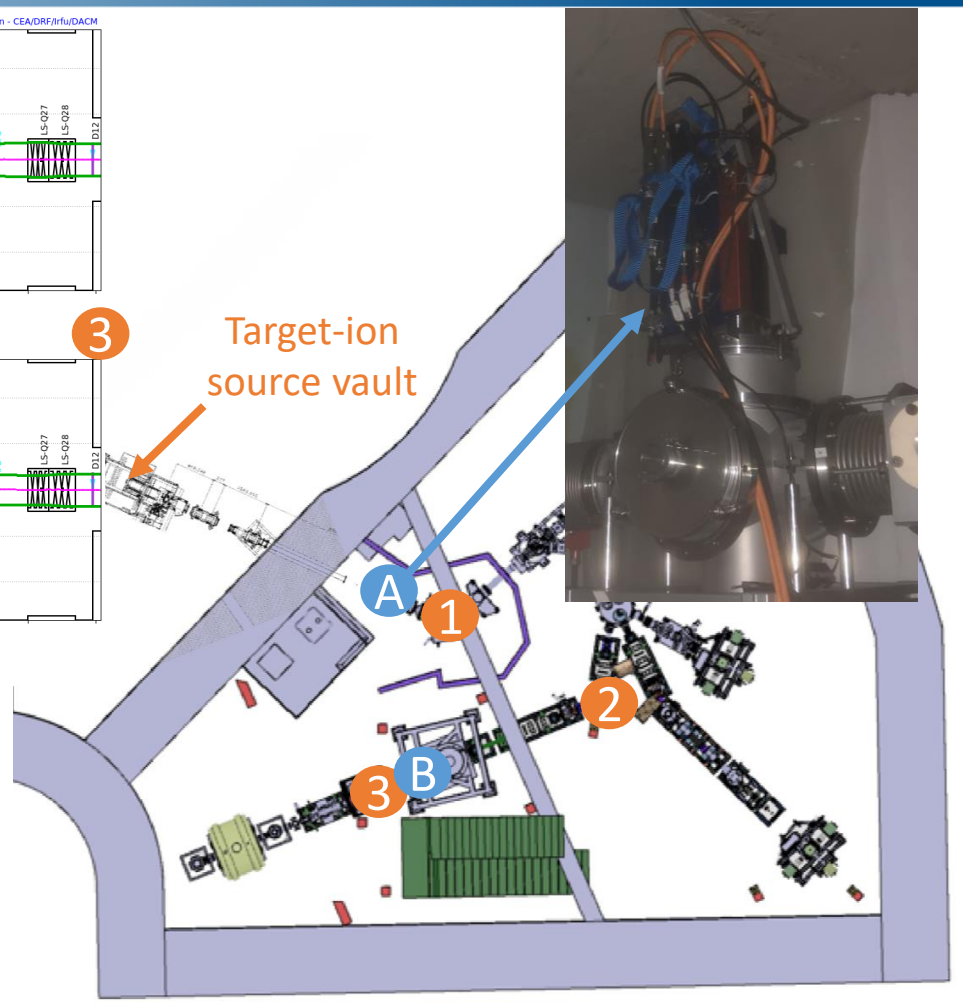


Particle distribution (^{120}Ag) after extraction electrode for laser ionization



Beam transport simulation : from target-ions source vault to RFQCB

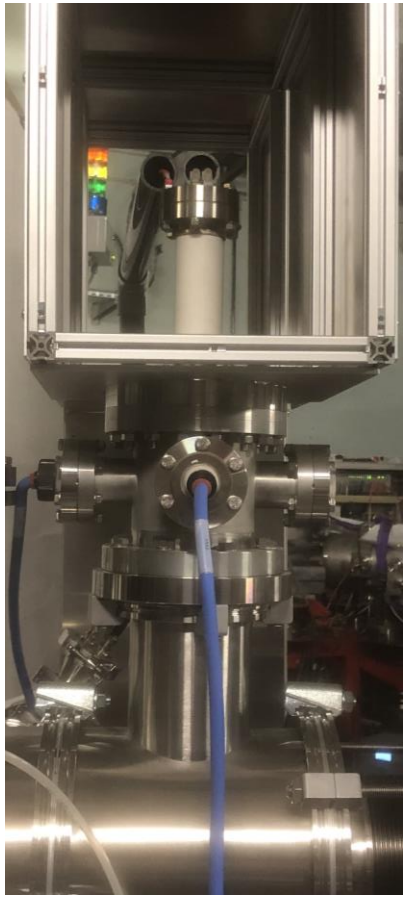


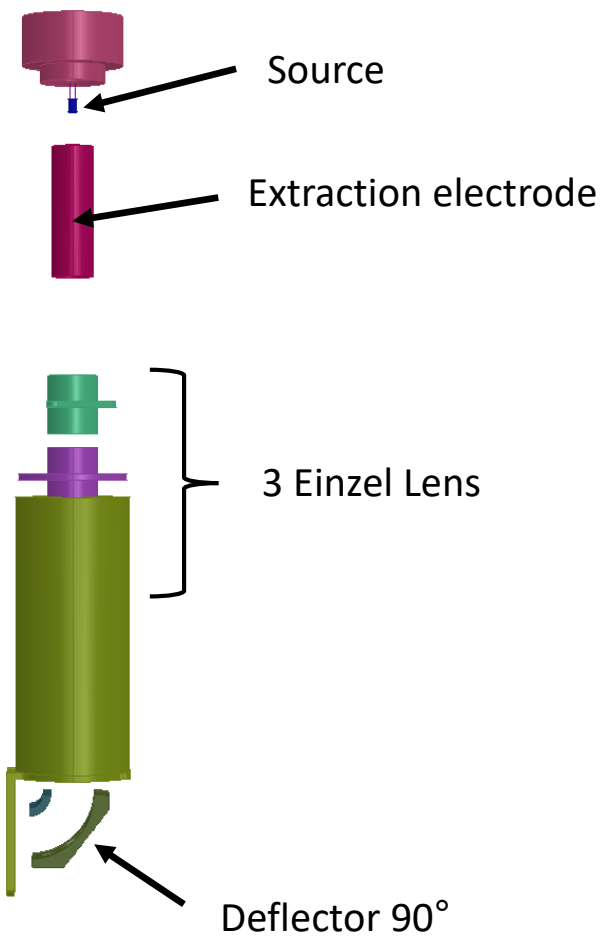


- Beam parallel
- Transmission : 52,1%
- Losses mostly because of slits after the magnetic dipole
  ↳ but good separation of isotopes

A B ⟶ Location for emittancemeter

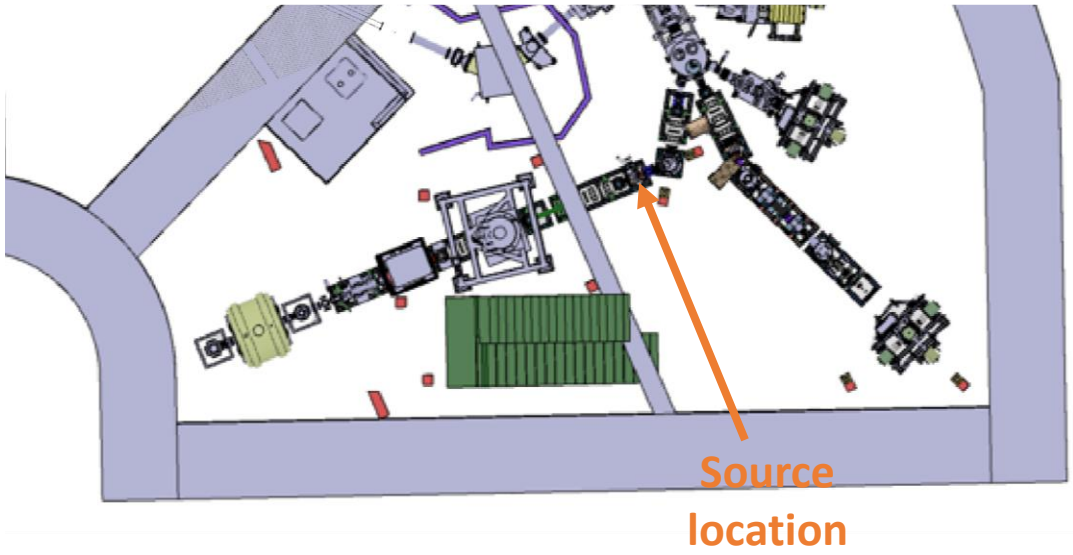
Beam transport simulation : Beam parameters from HV stable ion source



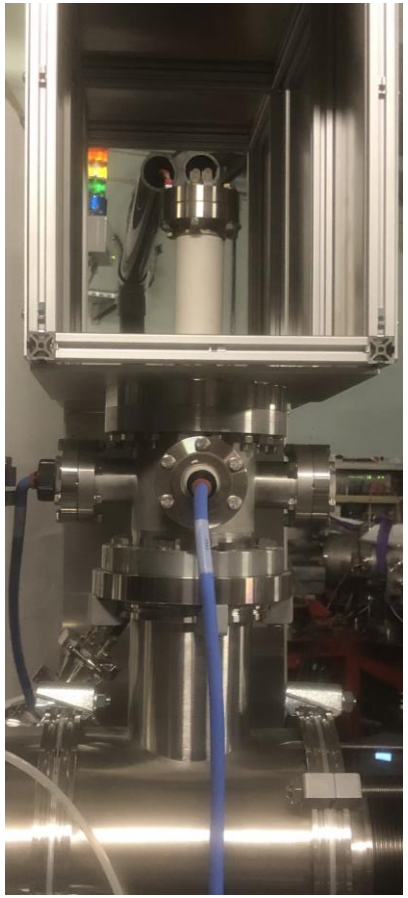


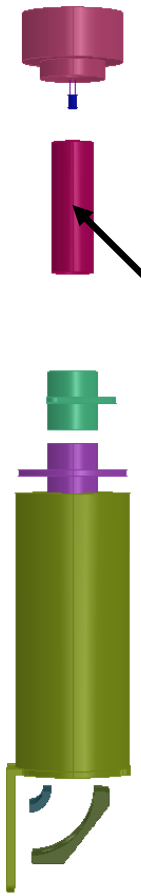
Source Cs and Rb :

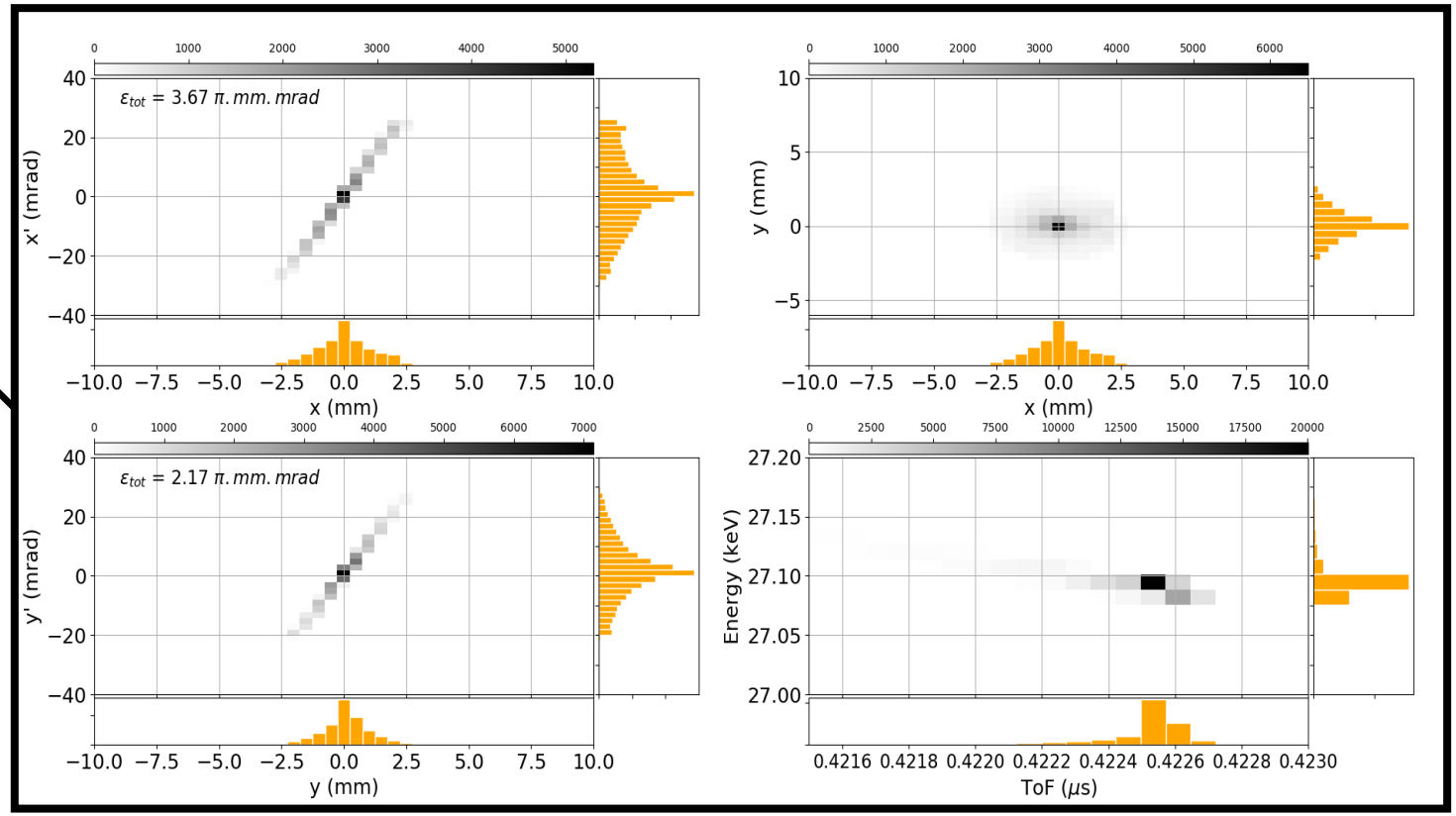
- Aligned and vacuum tested
- HT wiring in progress
- Reference ions for mass measurement
- Will be used for comissioning of RFQCB
- Simulation with Opera (Field Maps and Particle tracking)



Beam transport simulation : Beam parameters from HV stable ion source

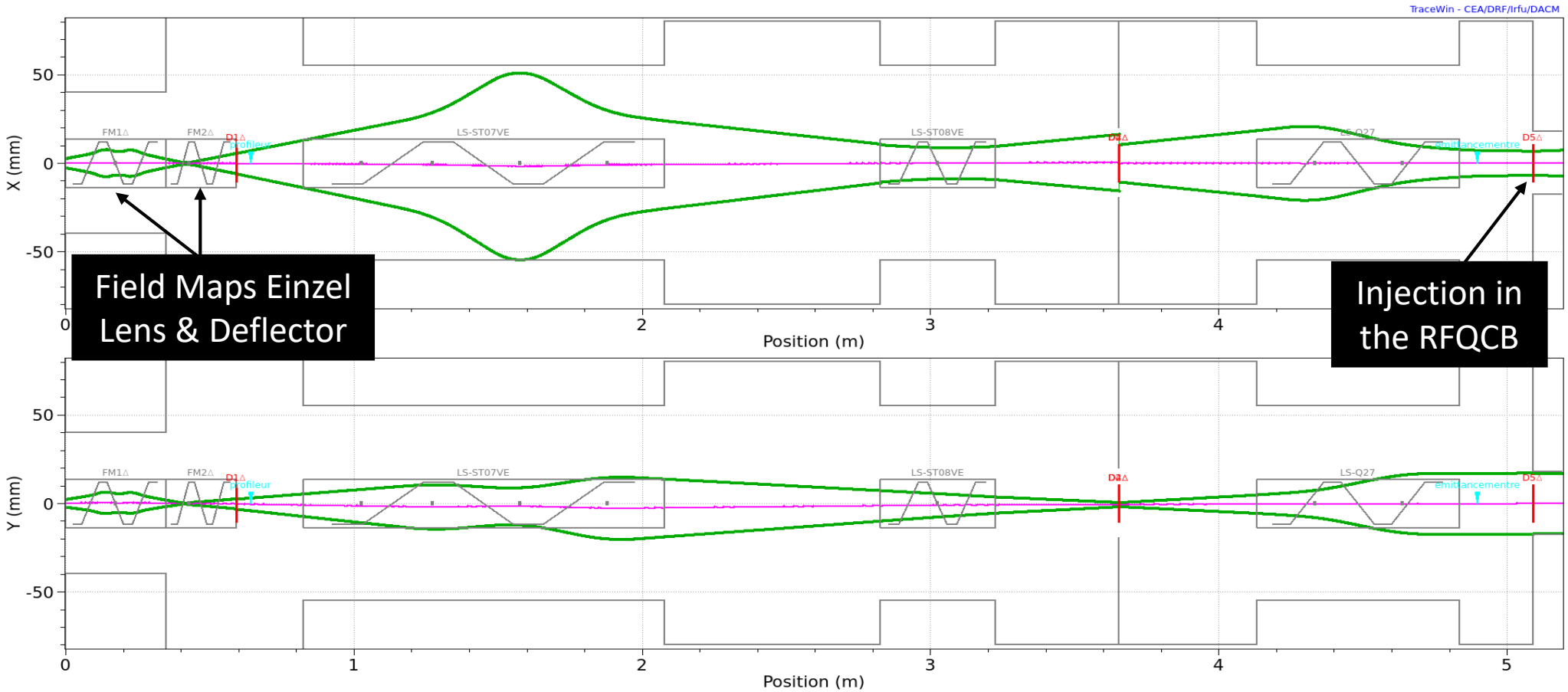






Particles distributions (^{133}Cs) extracted inside the extraction electrode
Crosschecked with simulation on Simion

Beam transport simulation : from HV stable ion source to RFQCB



- Beam parallel
- Transmission : 94.8%

Outlook

- Beam transport to RFQCB possible despite the constraints
- Emittancemeter already installed at ALTO-LEB and ready to be used
- Spring 2023 :
  - Installation of the preparation line expected to be over
  - Comissioning of the new transfer line and offline comissioning of RFQCB

Thank you for your attention

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