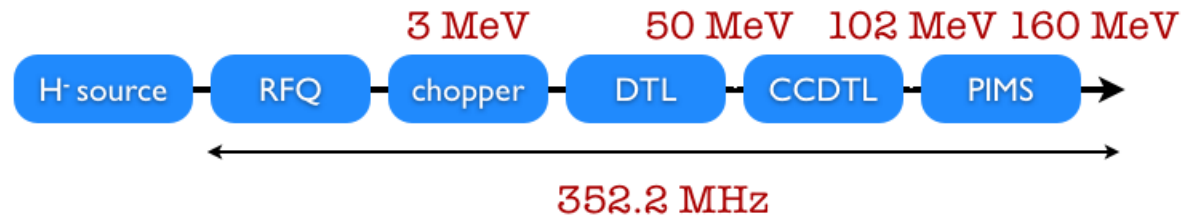


# Instrumentation for the new H<sup>-</sup> Source Test Bench

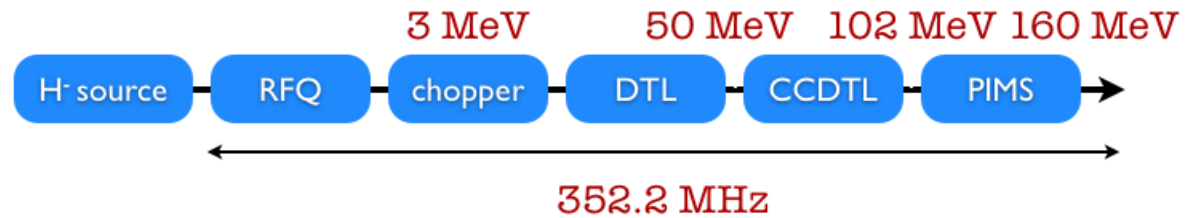
Linac-4 Ion Source Review 2013

Uli Raich for the  
CERN BE/BI team



## Instruments for new test stand

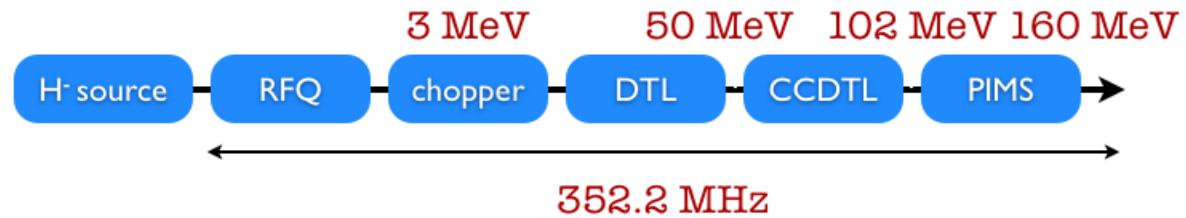
- SEMGrid
  - Same mechanism as current device
  - Wires can be polarized in addition to polarizing the frame
  - New analogue electronics (foreseen for Linac-4) (done)
- Faraday Cup
  - Possibility to polarize up to 46 kV (variable) to measure energy spread
  - Alternative: spectrometer which will not be used for Linac-4 any more (Faraday Cup is not polarized, only usable to measure beam intensity but not beam energy)
- Chinese copy of LEBT transformer (done)



## Instruments for new test stand (2)

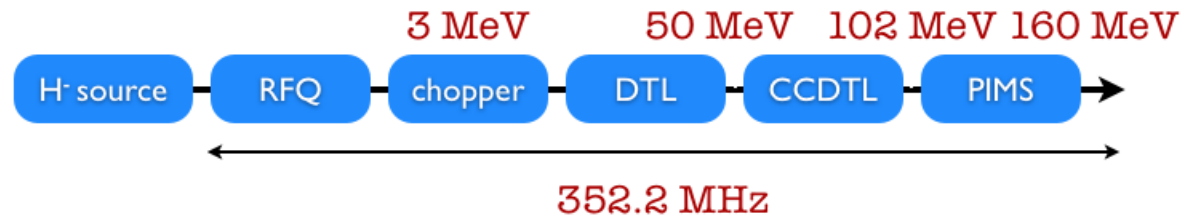
- New emittance meter
  - Mechanical changes foreseen (2 independent slits?)
  - Software was designed for commissioning only either needs to be maintained or replaced by standard CO Java application (4-5 months of work)  
(We now have 1 emittance meter for 45 keV and 1 emittance meter for 3 MeV)
- Diagnostics of electrons from source to be specified and not counted  
(not done)

To my best knowledge this has been done within the budget and within the foreseen delays

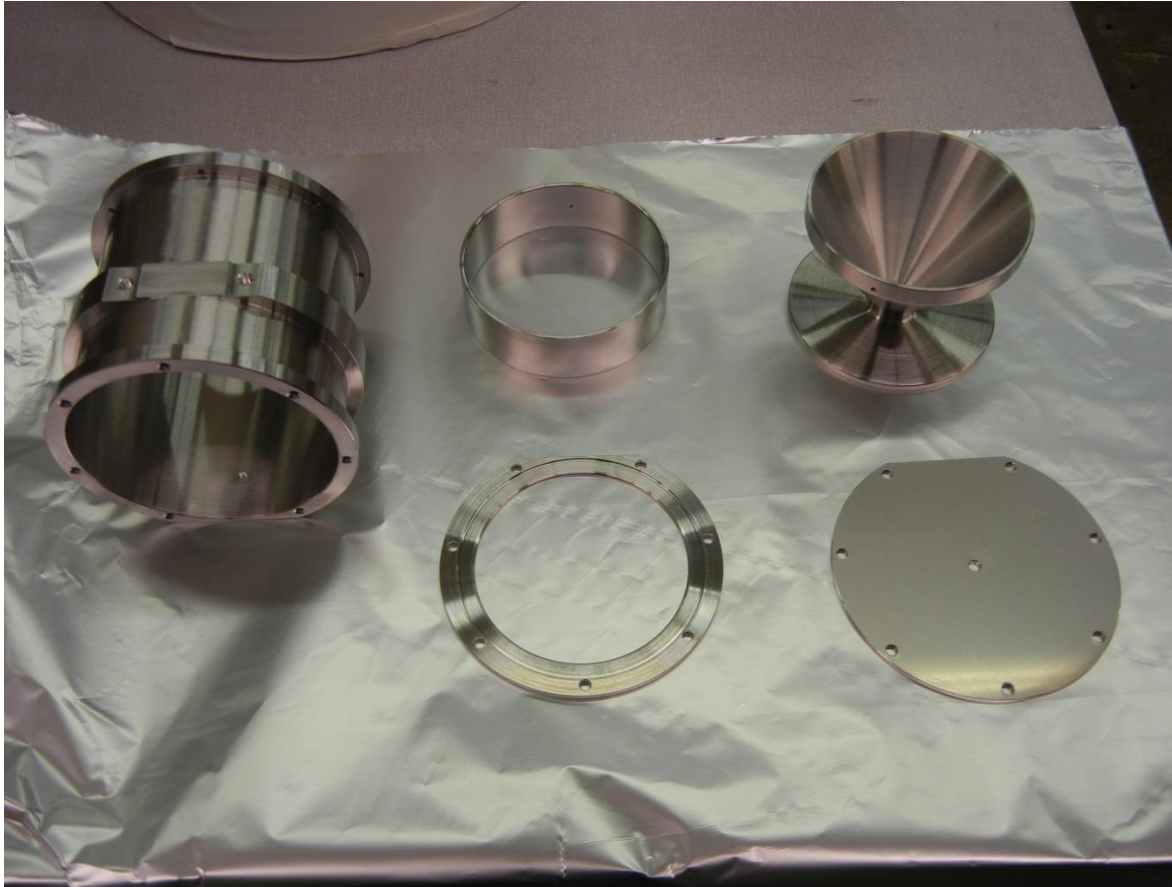


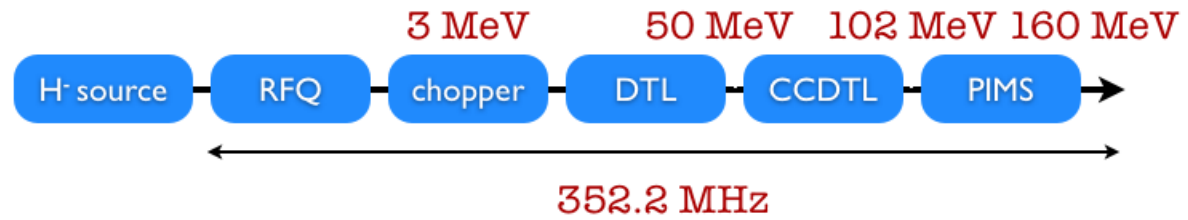
## What has been done

- Copied the instrumentation we have in the LEBT at Linac-4 (Faraday Cup and wire grid)
- Kept the 45 keV emittance meter, now installed on the test stand
- Built a new slit & grid device working at 3 MeV installed in the Linac-4 tunnel
- Chinese copy of the LEBT transformer

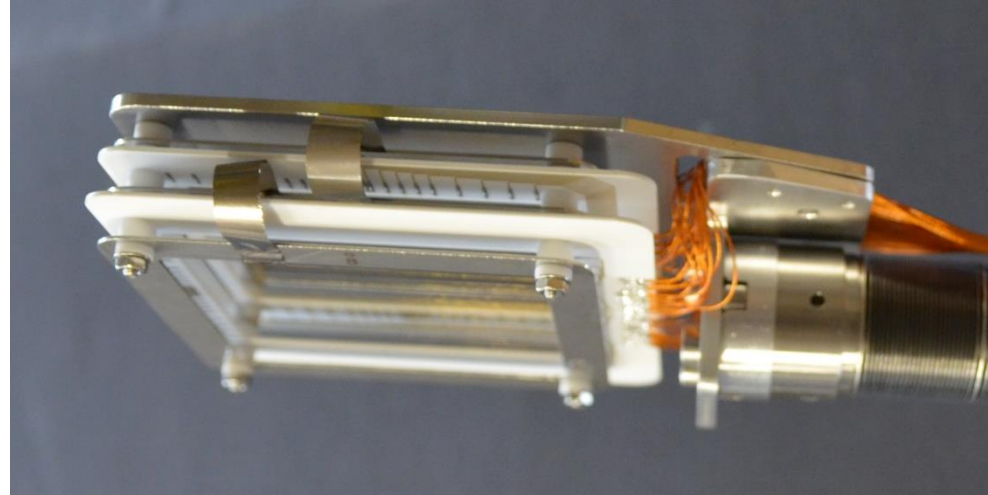
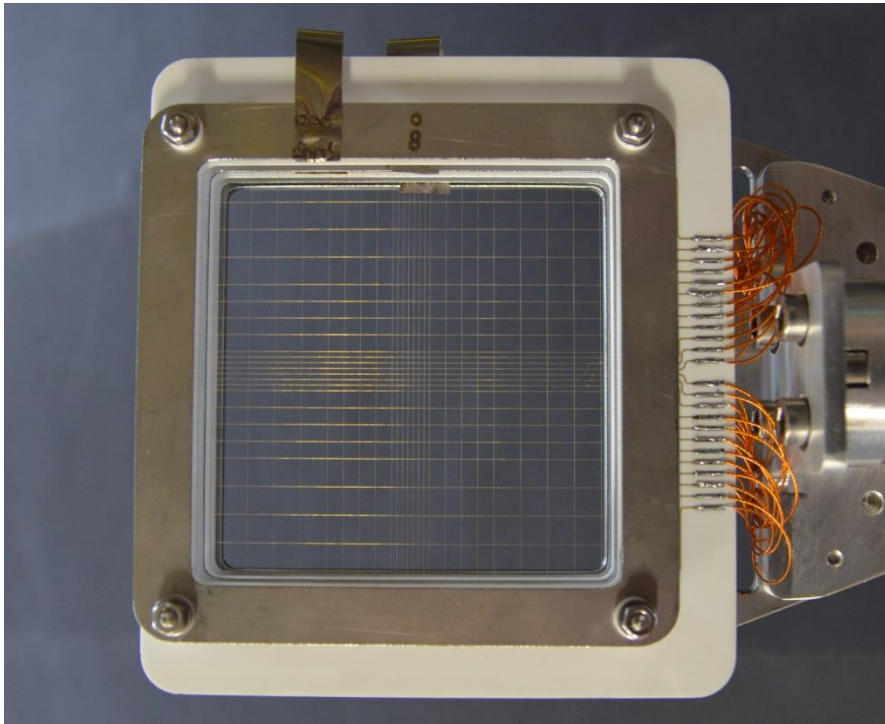


## Faraday Cup





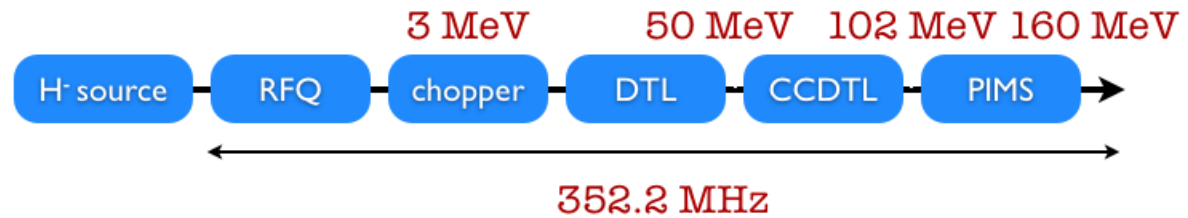
## LEBT wire grids



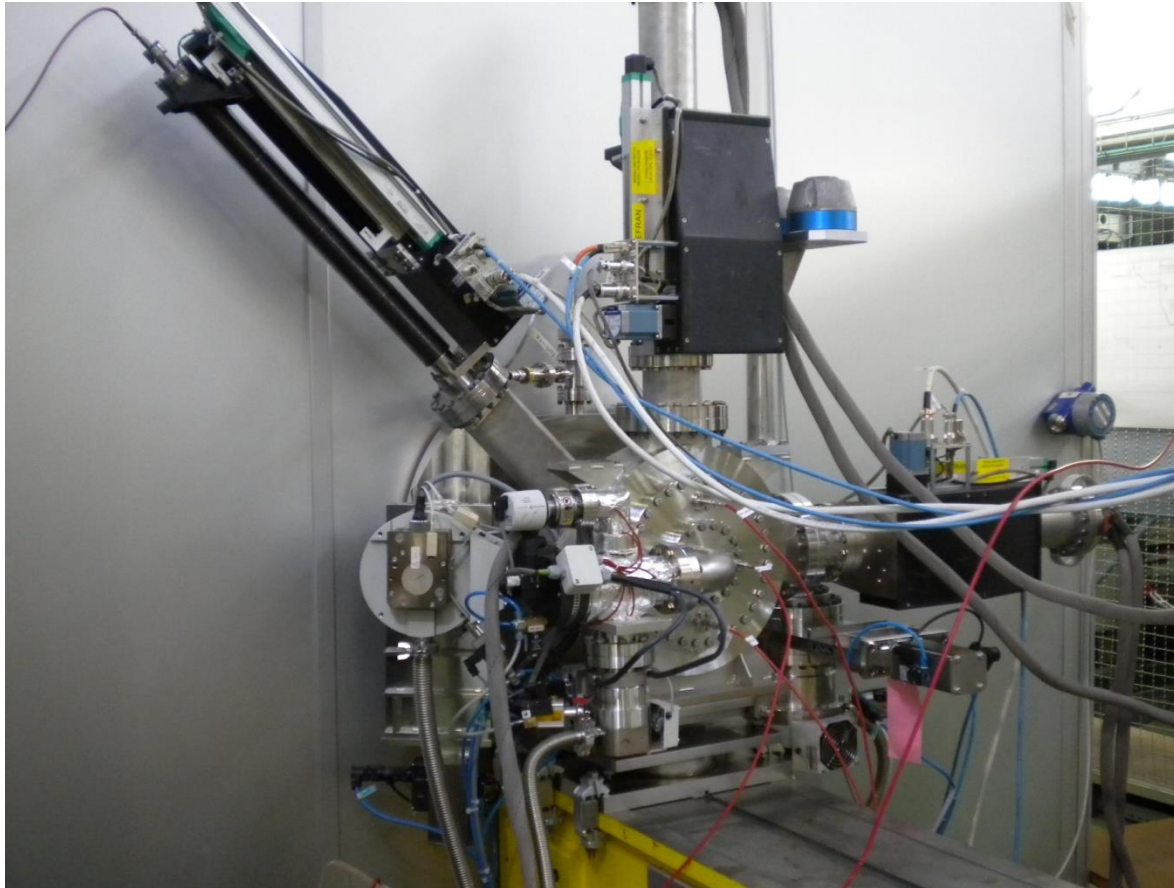
Analogue electronics has been updated to latest version

Sandwich of horizontal and vertical plane  
24 wires with increasing wire spacing towards the outside





## Transverse Emittance Measurement



Slit and grid phase space scanner

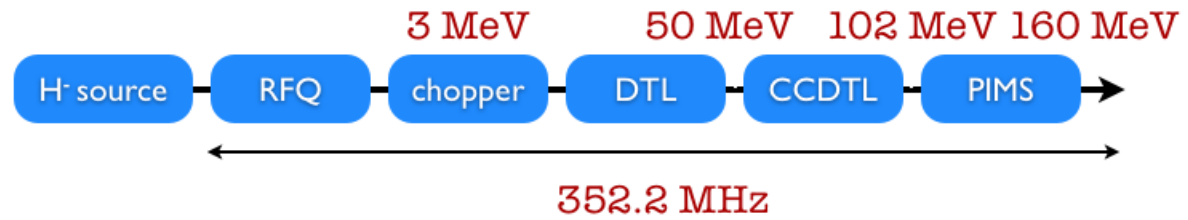
L-shaped 0.1mm slit moves under 45 degrees

Slit and grids move independently  
Positioning precision: 50  $\mu\text{m}$   
Movement PLC controlled

Slit and grids mounted in 2 independent vacuum boxes which can be separated

Horizontal and vertical SEMGrid

- wire distance .75 mm
- 30 signal wires
- readout with home built 36 channel 250 kHz ADC
- time resolved profiles

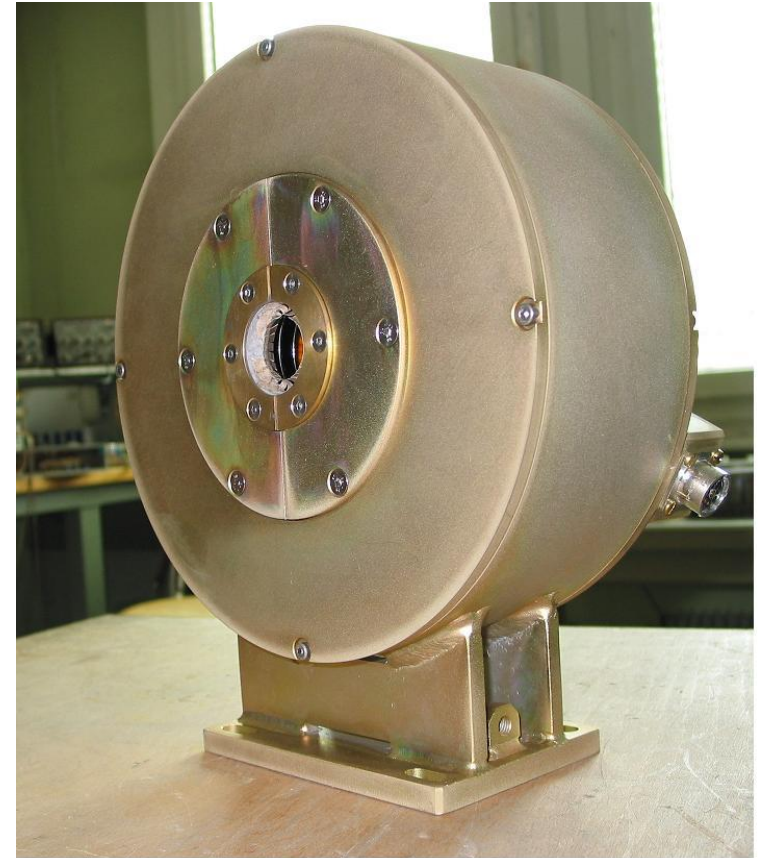
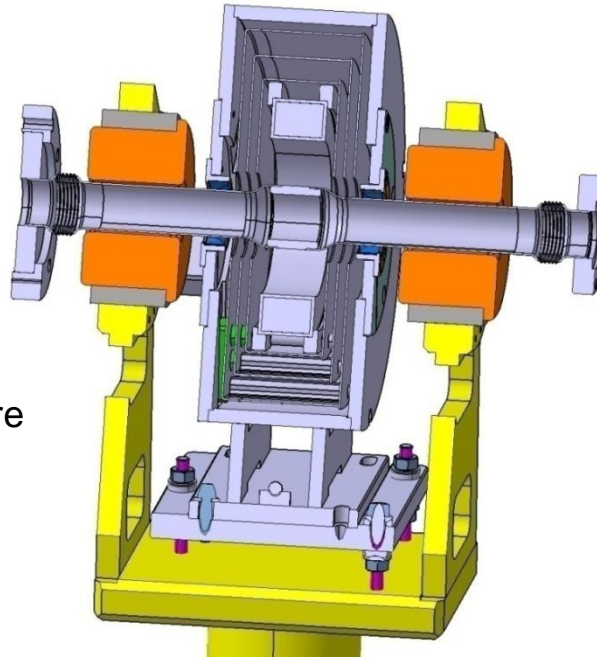


## Current Transformers

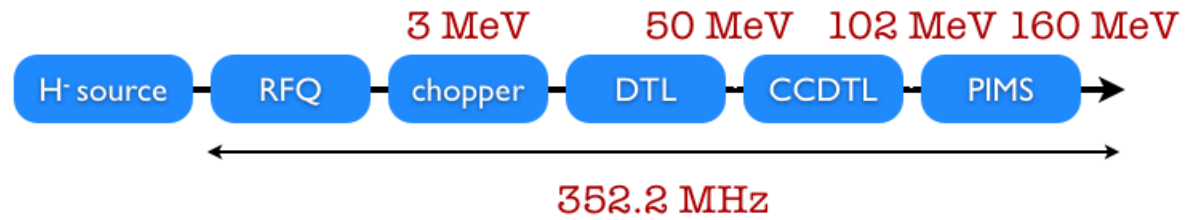
Good magnetic shielding avoids interference from nearby pulsing quads

Shielding simulation and test measurements have been done

New electronics and software has been developed for L4  
Needs no additional work







## Maintenance manpower

1 month FTE per year for

- Small changes
- Maintaining mechanisms
- Keep electronics + software running