

ESS Front End diagnostic

Benjamin Cheymol

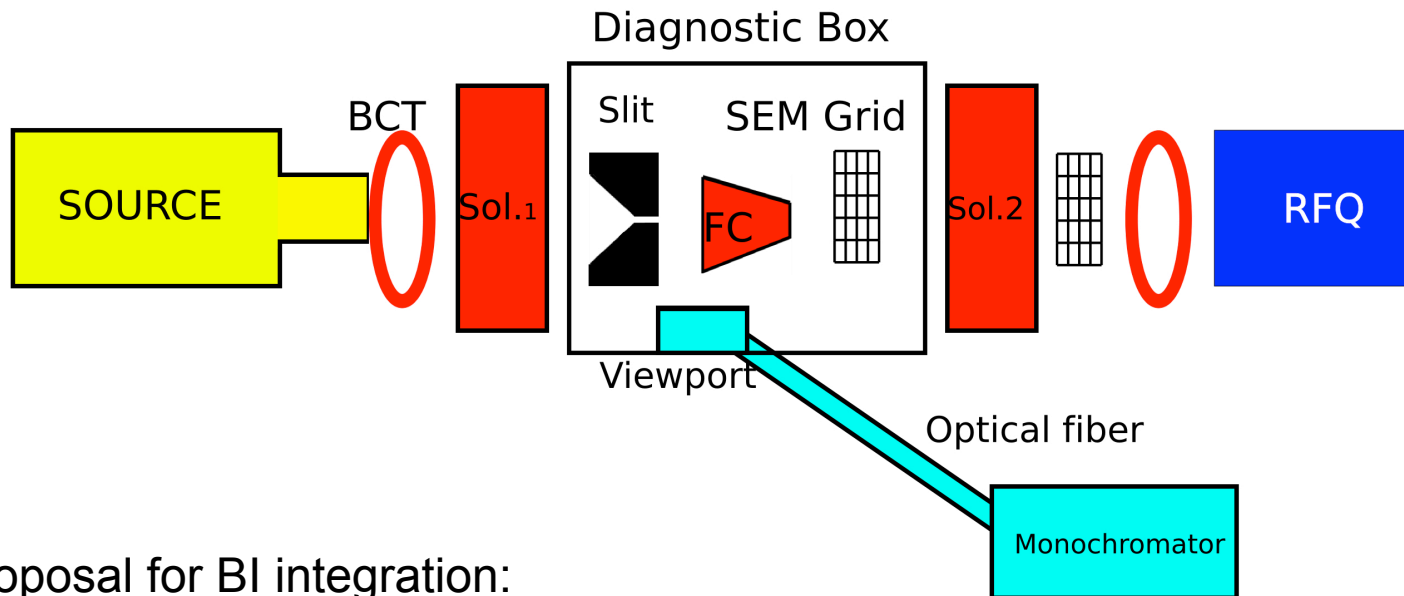
2nd SLHiPP meeting, Catania

2012-05-04



- LEBT instrumentation
- MEBT instrumentation
- DTL intertank region
- Transition DTL-Cold linac
- Issue

LEBT-Instrumentation layout

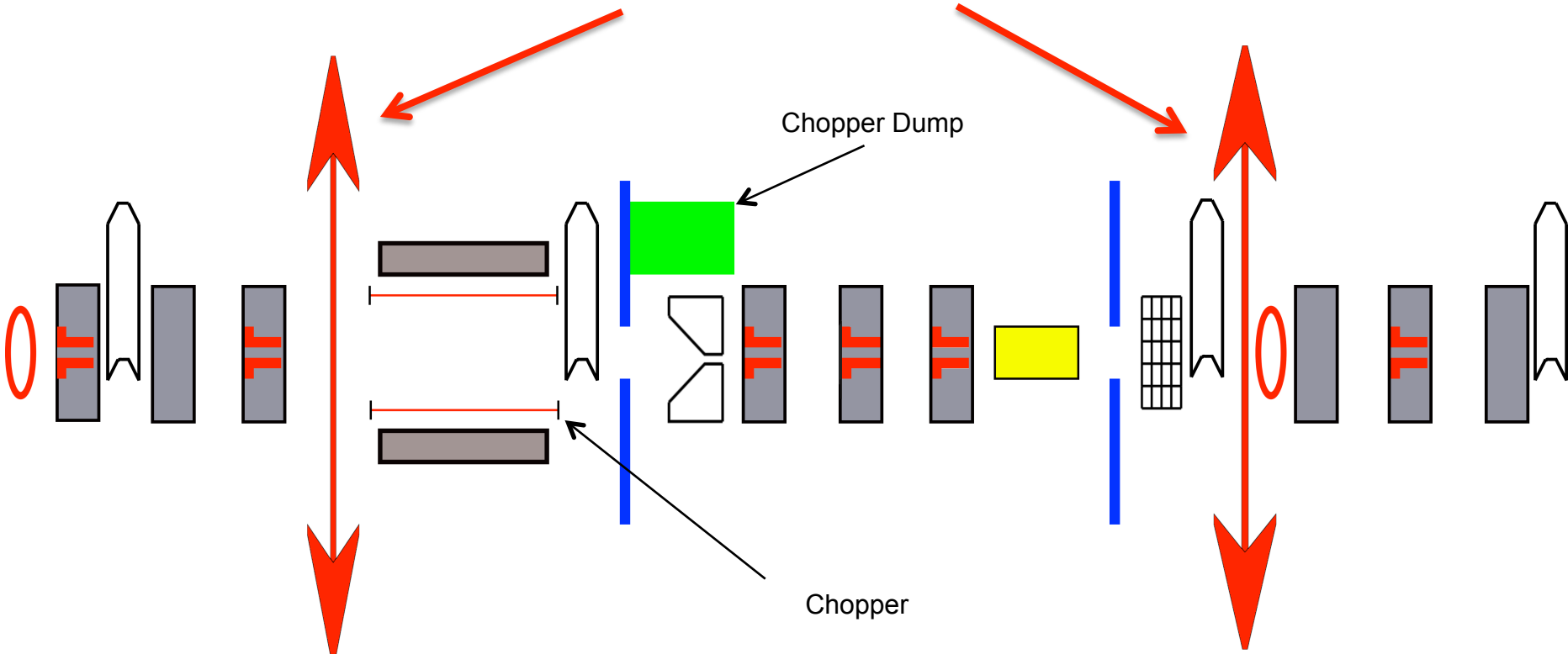


- Proposal for BI integration:
 - Current measurement
 - 2 BCTs and one Faraday cup
 - Beam profile
 - 2 SEM grids (H+V)
 - Emittance
 - Slit and grid system (grid used also for profile measurement)
 - Ions species fraction
 - Viewport +monochromator

- Make a permanent test line in the MEBT
 - Transverse emittance
 - Longitudinal beam profile
 - Beam current
 - Beam position
 - TOF
 - Beam profile
 - Transverse halo
 - Fast chopping efficiency
- A beam stopper is needed for dedicated studies of the MEBT



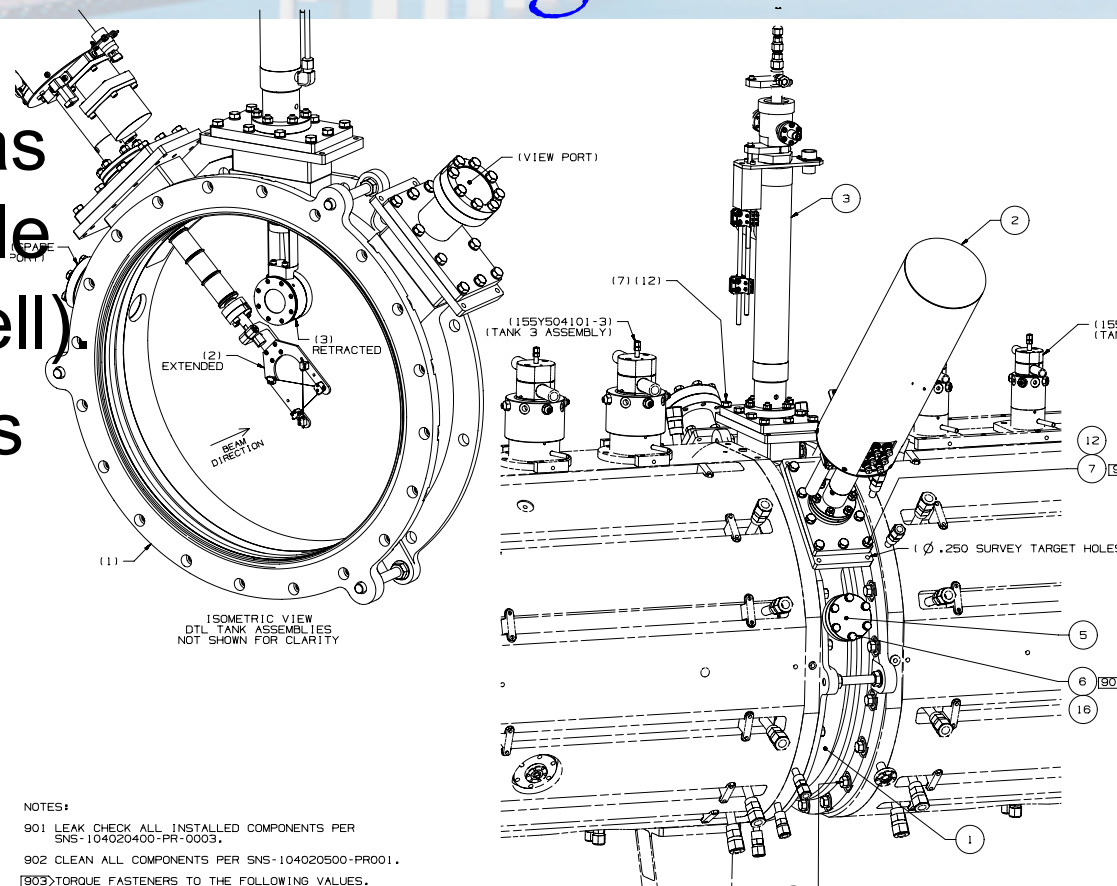
Buncher Cavities



	BPM (position and TOF)		SEM grid
	Wire scanner		BCT
	BSM		Slit
	Collimator		Quad

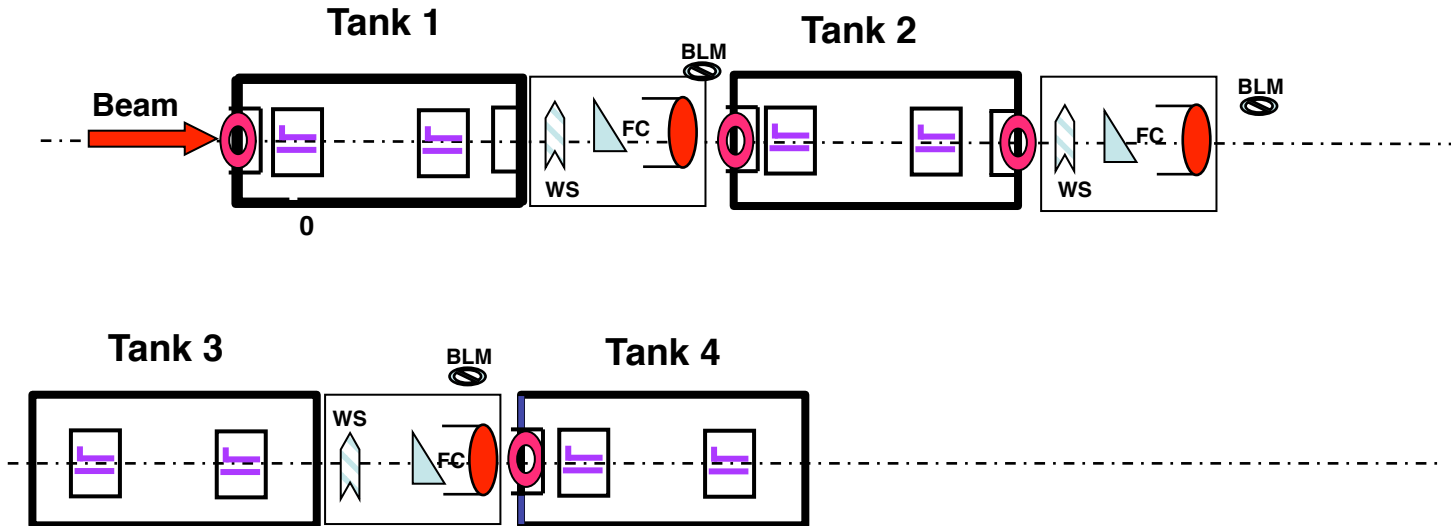
DTL design concept has moved from Linac4 style to SNS style (FODO cell)

- Inter-tank diagnostics box
 - Faraday cup
 - Wire scanner
- In-tank BPMs
- BCT inserted in the Tank



In addition BLM will be installed as close as possible to the beam

DTL BI layout



Symbol	Name	Number of units
	DTL Tank	6
	Wire Scanner	5
	Beam Loss Monitor	6
	Energy degrader	5

Symbol	Name	Number of units
	BPM / Phase detector in DT	10
	Current Monitor (Toroid)	6
	Faraday cup (Beam stop)	5

- As for the MEBT, our proposal is to have a permanent test line with:
 - BSM
 - Emittance measurement with Quad scan method
 - Current measurement with BCT
 - Beam position and TOF
 - Profile and halo measurement with wire scanner
- A beam stopper is needed in order to avoid losses in cold linac during measurements.

- Space limitation in the MEBT and in the transition warm/cold linac
 - New MEBT design is under study
 - Layout of the transition region to be completed
- Thermal load on interceptive device
 - Pulse length has to be reduced
 - » Preserve the wire integrity
 - » Reduce the thermionic emission
 - Carbon can be used in warm linac



Thanks for your attention

- Slit based on LINAC4 design

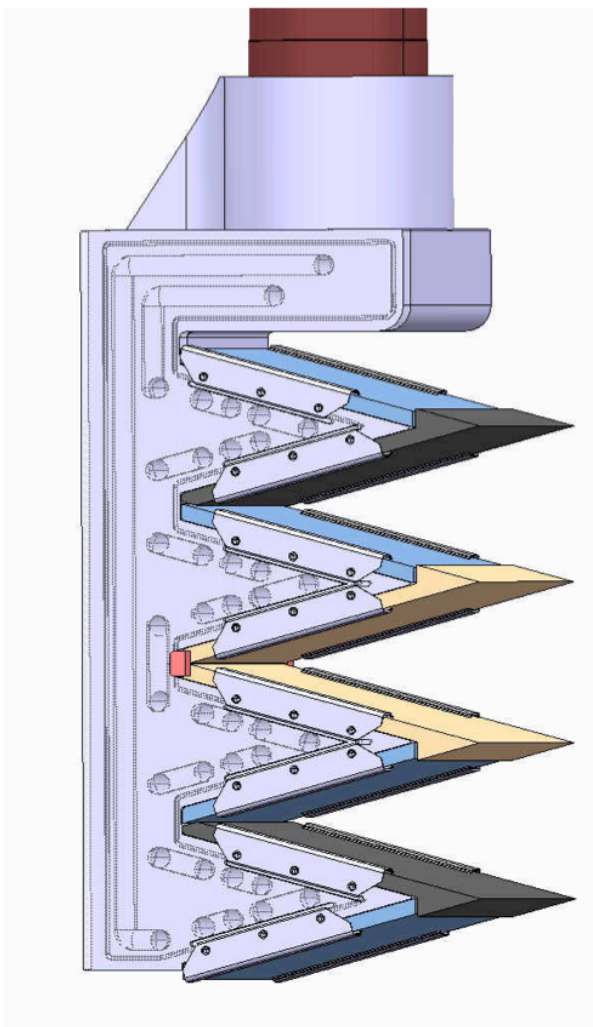
Graphite blade on Copper block

Beam parameter at the MEBT
 $\sigma_x=3.1$ mm, $\sigma_y=3.5$ mm

$I=65$ mA

Pulse length = 100 μ s

$T_{max}=1400$ K, limits of graphite reached

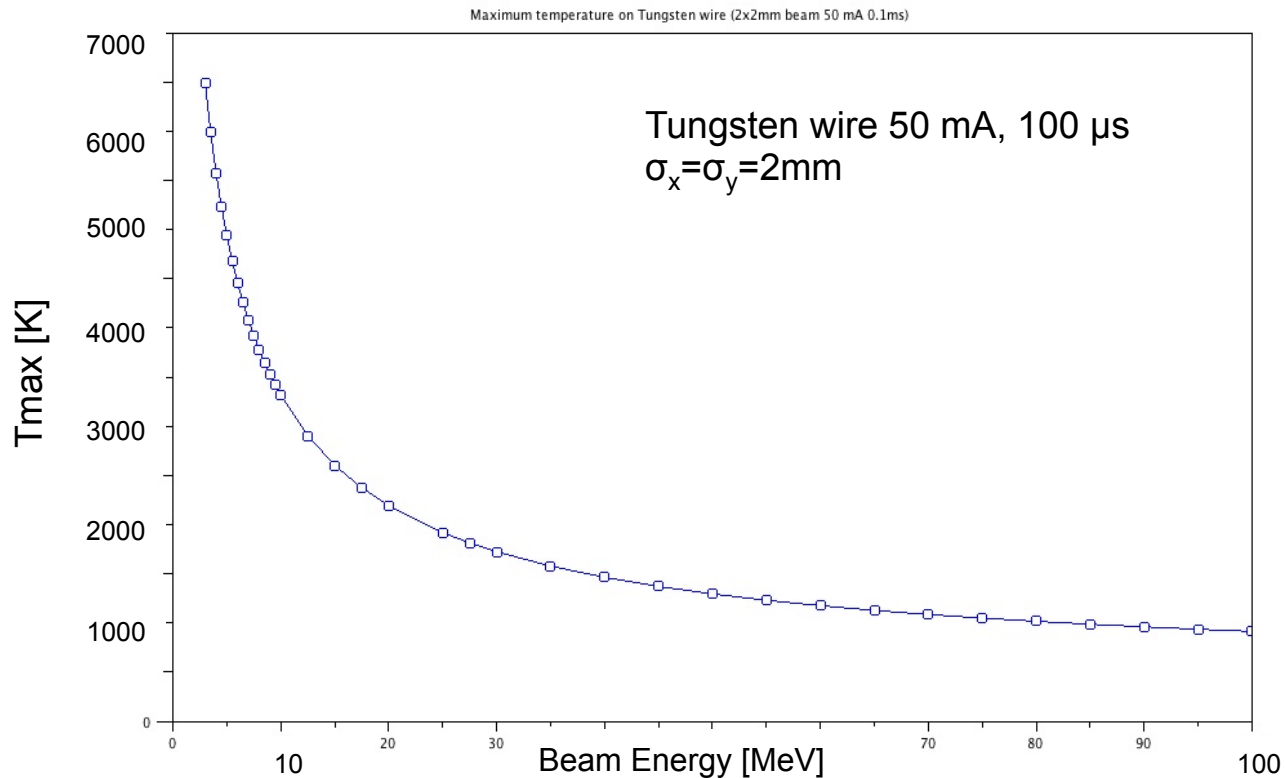


BEAM



Carbon or tungsten wire for the grid
 Bias polarization under discussion

- Similar mechanical design as the MEBT
- Thermal load implies to reduce the beam pulse to 100 μs
- Carbon is the best candidate for wire material



- BI line at the exit of DTL

