

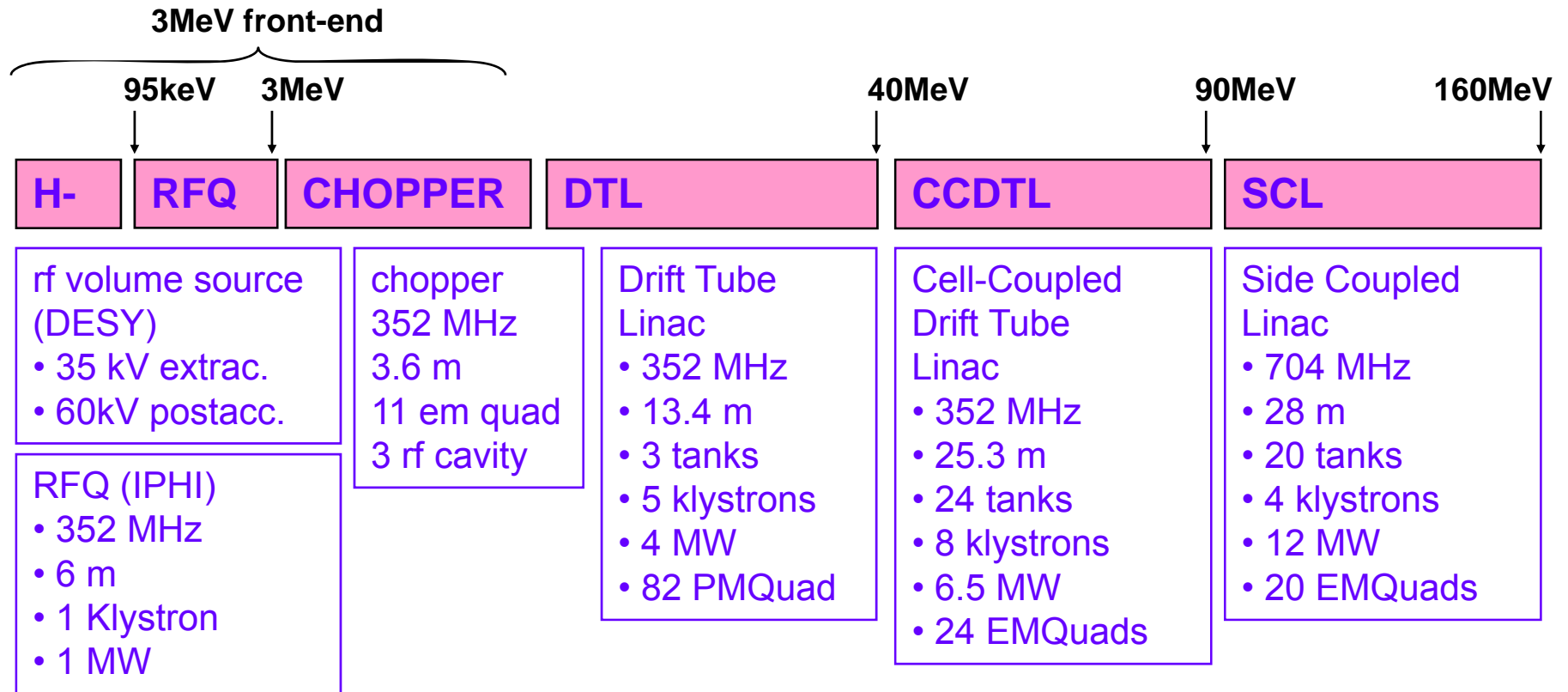


Linac 4 Instrumentation Needs

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Overview of Instrumentation Needs



Linac 4 TDR CERN-AB-2006-084 ABP/RF



Commissioning and Operation

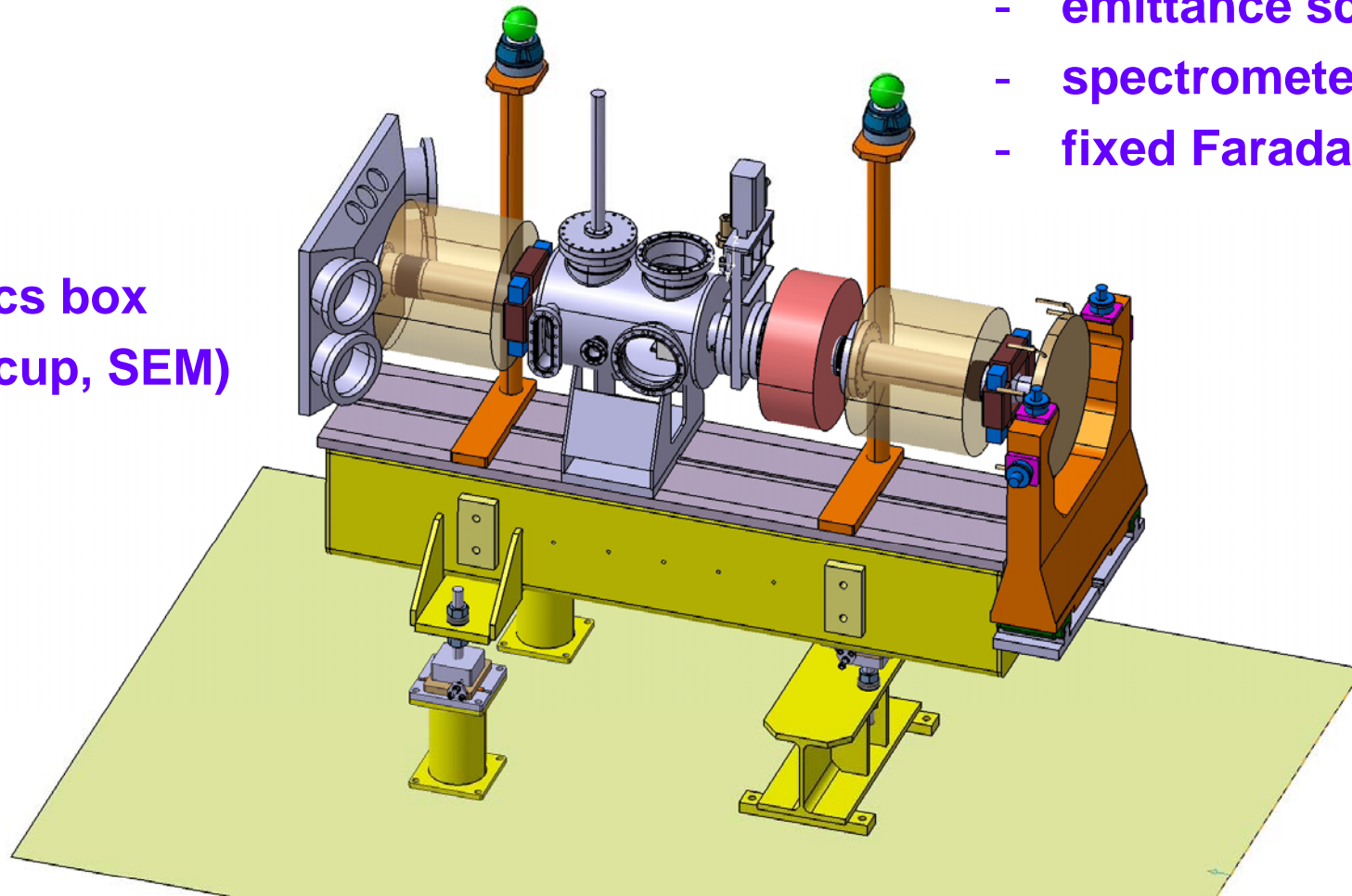
commissioning phase:

- moveable bench for different stages of the DTL
Faraday Cup, SEM grid, transverse and longitudinal emittance diagnostics, 2 pick-ups (tof)
 - for DTL tank-by-tank commissioning
 - SNS experience with “D-Plate”
- IPHI diagnostic line for the 3 MeV front-end
wire scanners, spectrometer, pick-ups, transformers, time-of-flight
→ see presentation P.Ausset



Source & LEBT

diagnostics box
(Faraday cup, SEM)



- emittance scanner
- spectrometer
- fixed Faraday cup

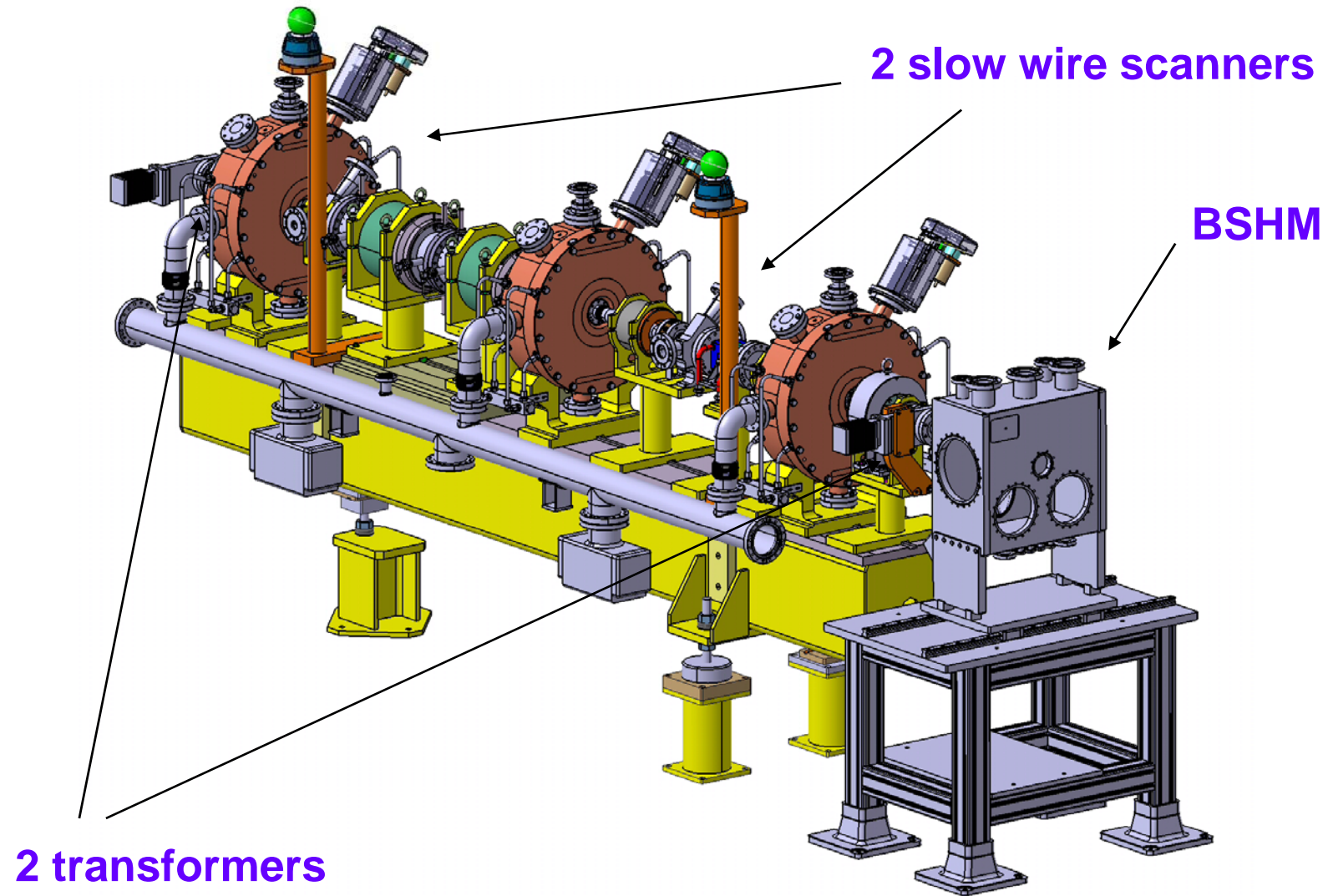


Source & LEBT

instrument	position	energy [MeV]	intensity [mA]	resolution
retractable Faraday cup	between solenoids	0.095	80	0.1 mA
fixed Faraday cup	before RFQ	0.095	80	0.1 mA
SEM grid	between solenoids	0.095	80	2 mm
SEM grid	after spectrometer	0.095	80	1 mm
transformer		0.095	80	1 mA
emittance	movable	0.095	80	1 mrad



Chopper Line



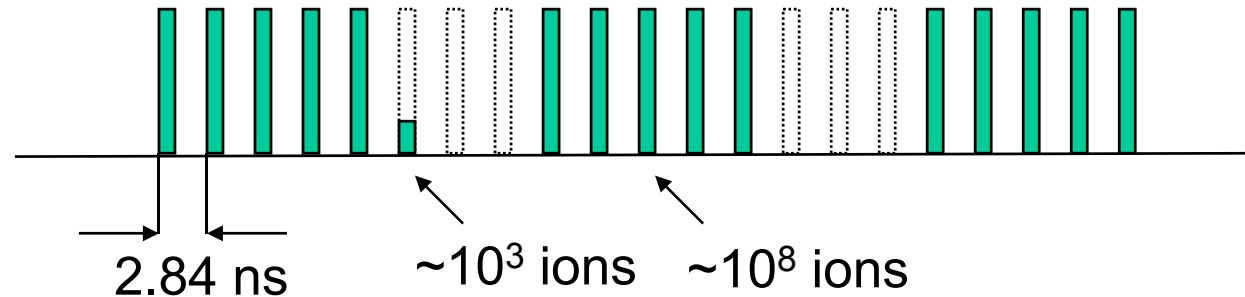


Chopper Line

instrument	position	energy [MeV]	intensity [mA]	resolution
slow wire scanners	upstream and downstream of chopper	3.0	80	0.1 mm
transformer	between first two and last two quads	3.0	80	0.5 mA
beam shape and halo monitor	end of chopper line	3.0	80	1 ns 1 mm



BSHM: Requirements



- **1st objective:**

measure residual H^- in (not completely) chopped bunches with a sensitivity of ~ 1000 ions, in the vicinity of full bunches ($\sim 10^8$ ions). detector must be turned on/off within 1 ns, **dynamic range 1:10⁶**

- **2nd objective:**

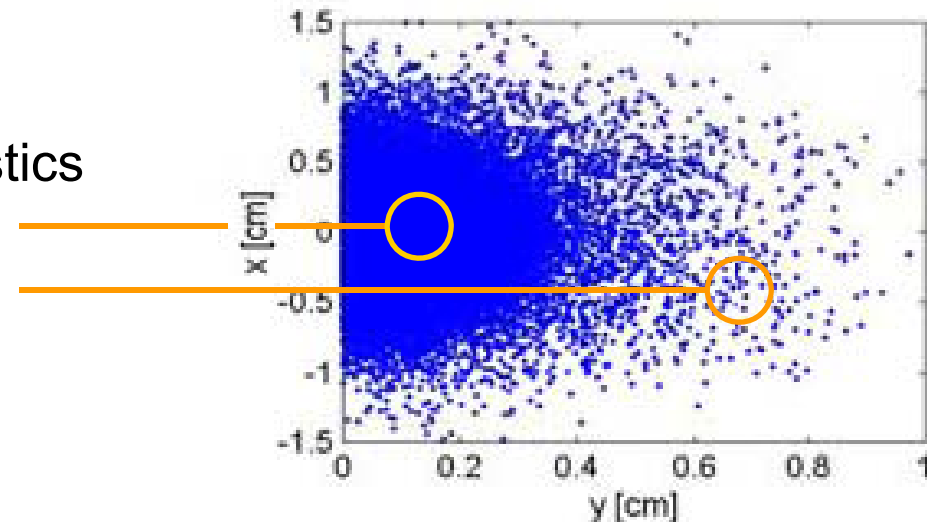
transverse imaging, halo diagnostics

beam core: $\sim 10^8$ H^- /bunch/cm²

beam halo: $\sim 10^3$ H^- /bunch/cm²

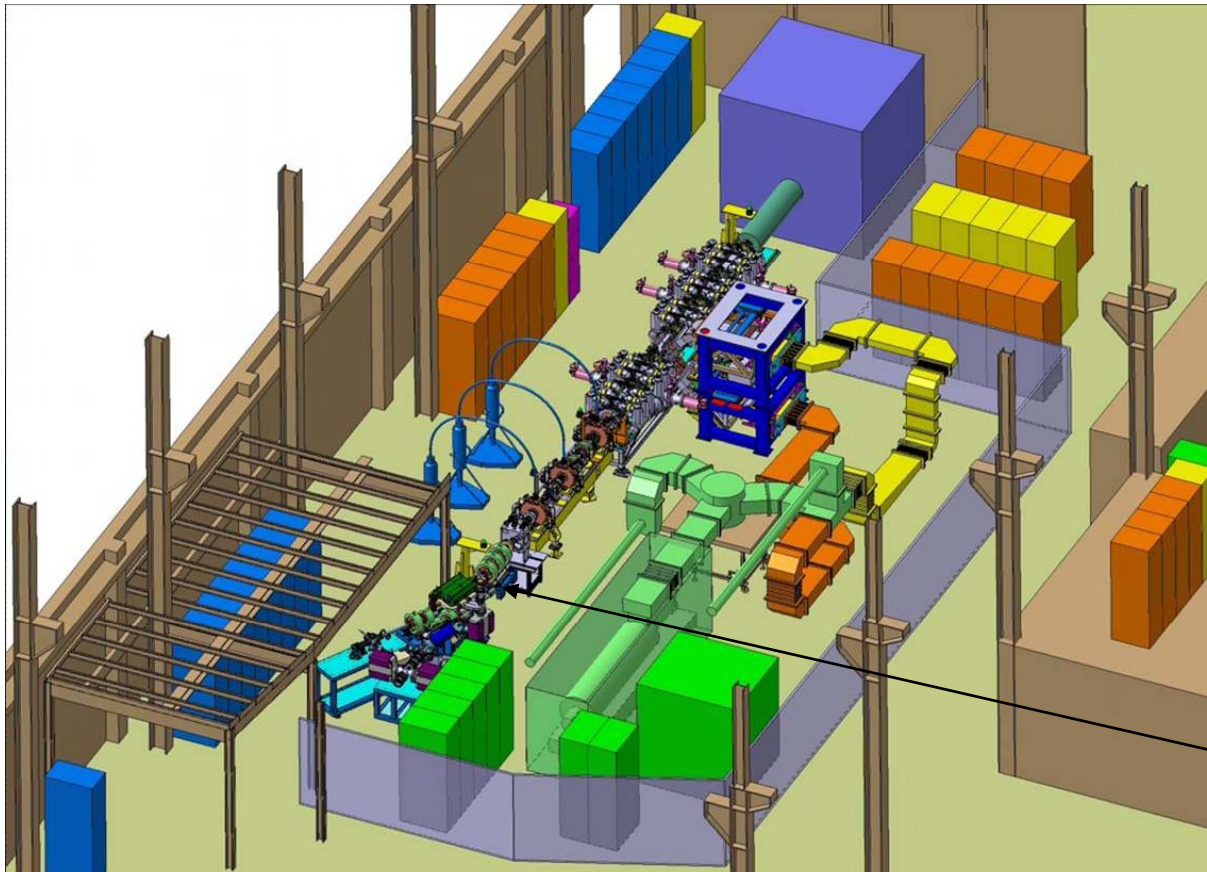
active area of detector 4 × 4 cm

dynamic range: 1:10⁶





3 MeV Test Place



IPHI diagnostic line

3 MeV test place in the PS South Hall including source, LEFT, RFQ, chopper line and IPHI diagnostic line



DTL



SEM grid



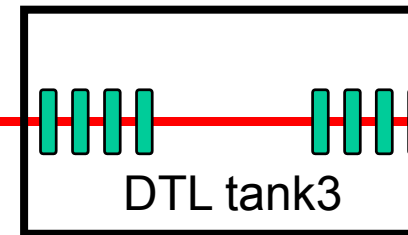
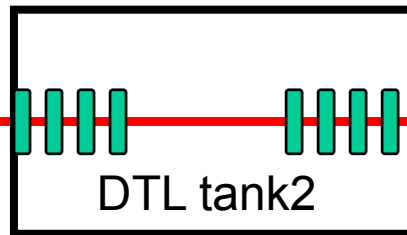
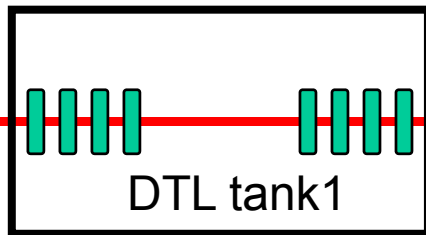
beam current transformer



beam loss monitor



position, intensity and phase pick-up





DTL

instrument	position	energy [MeV]	intensity [mA]	resolution
pick-up (phase, position, intensity)	after every tank	10/20/40	40	0.1 deg 0.1 mm 0.5 mA
SEM grid	after tank 3	40	40	0.5 mm
transformer	after tank 3	40	40	0.5 mA



CCDTL



SEM grid



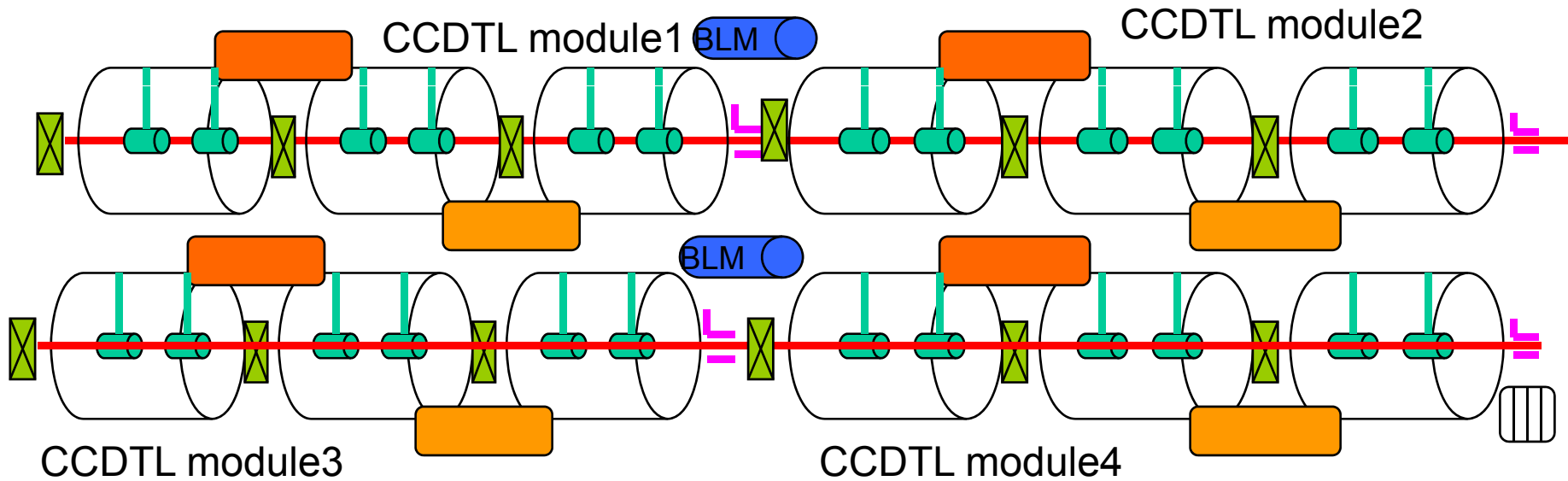
beam current transformer



beam loss monitor



position, intensity and phase pick-up





CCDTL



SEM grid



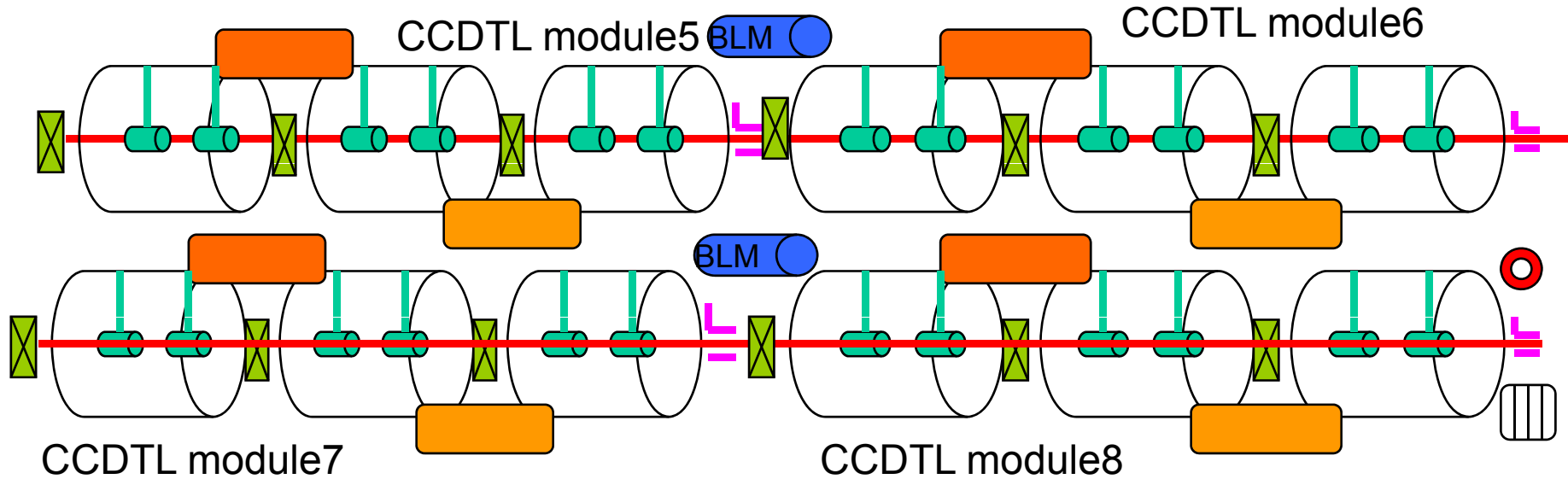
beam current transformer



beam loss monitor



position, intensity and phase pick-up



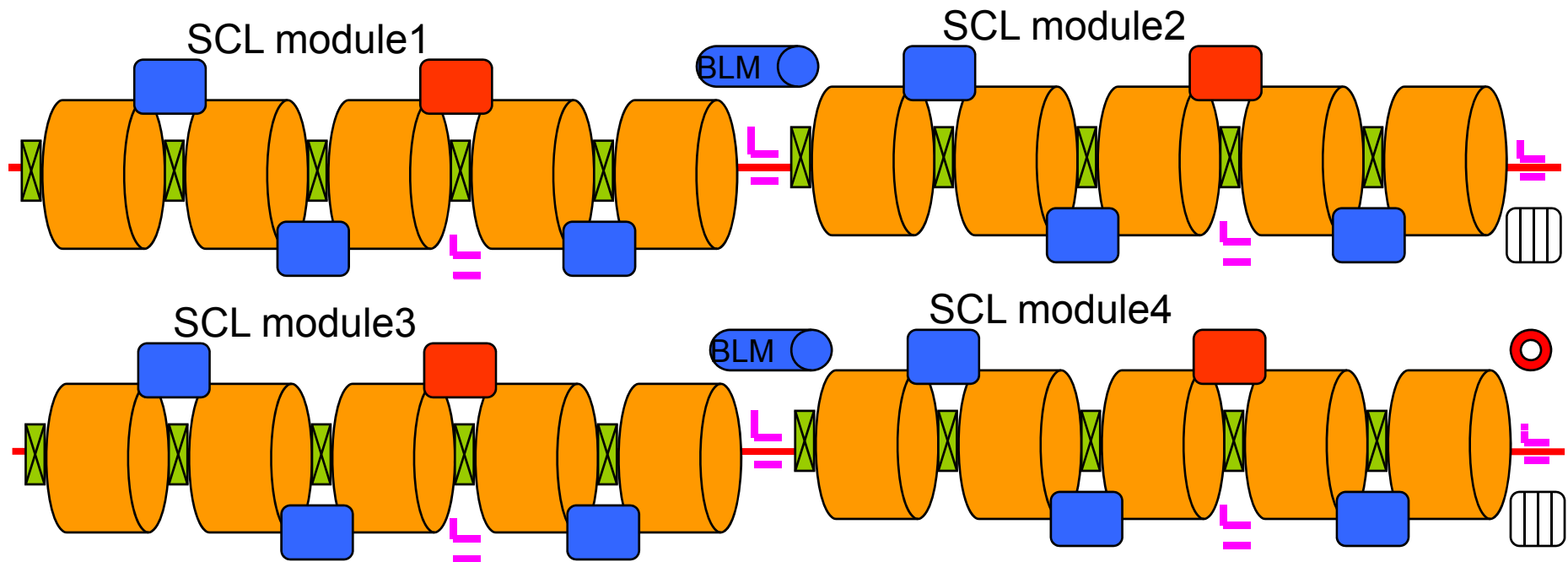
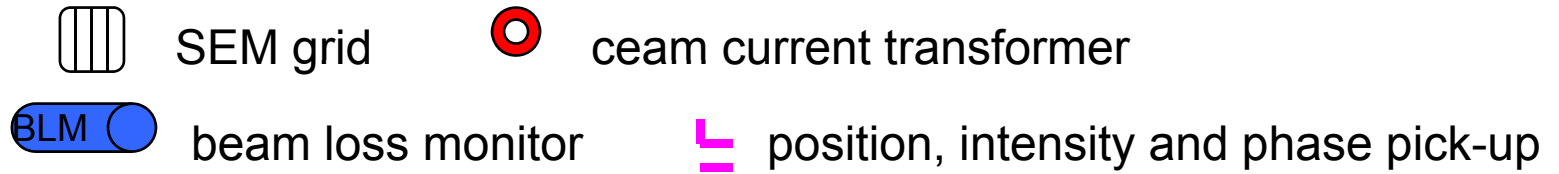


CCDTL

instrument	position	energy [MeV]	intensity [mA]	resolution
pick-up (phase, position, intensity)	after every module	45.9/52.2/ 58.6/65/71.5/ 78.1/84.6/ 91.1	40	0.1 deg 0.1 mm 0.5 mA
SEM grid	after modules 4 and 8	65/91.1	40	0.5 mm
transformer	after module 8	91.1	40	0.5 mA



SCL





SCL

instrument	position	energy [MeV]	intensity [mA]	resolution
pick-up (phase, position, intensity)	after every module plus 1/module	106.7/124.7/ 148.8/164	40	0.1 deg 0.1 mm 0.5 mA
SEM grid	after modules 2 and 4	124.7/164	40	0.5 mm
transformer	after module 4	164	40	0.5 mA



Transfer Line and PSB Injection

transfer line:

- pick-ups, BLMs, profile monitors as in the linac transfer line design pending
- emittance diagnostics at the exit of the linac and before PSB injection

Booster injection period:

profile/position measurement to adjust the beam on the stripper foils