



CERN H4 beam / CERN PS facility

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Content

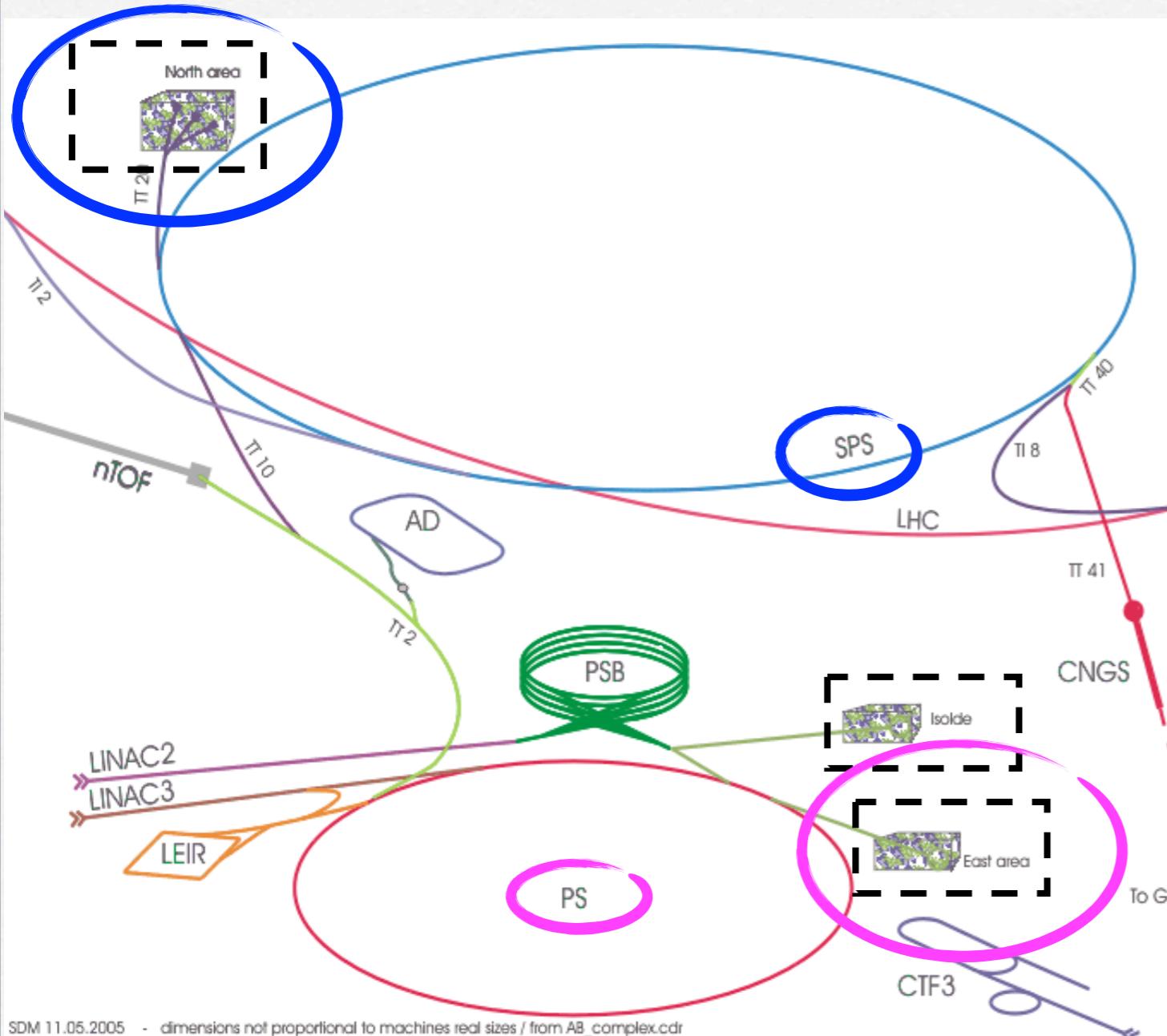
- Test beam facilities @ CERN
- North Area and H4

DISCLAIMER:

All information was taken from CERN website*,
unfortunately it has not been validated by SBA
beam physicists

*<http://sba.web.cern.ch/sba/>

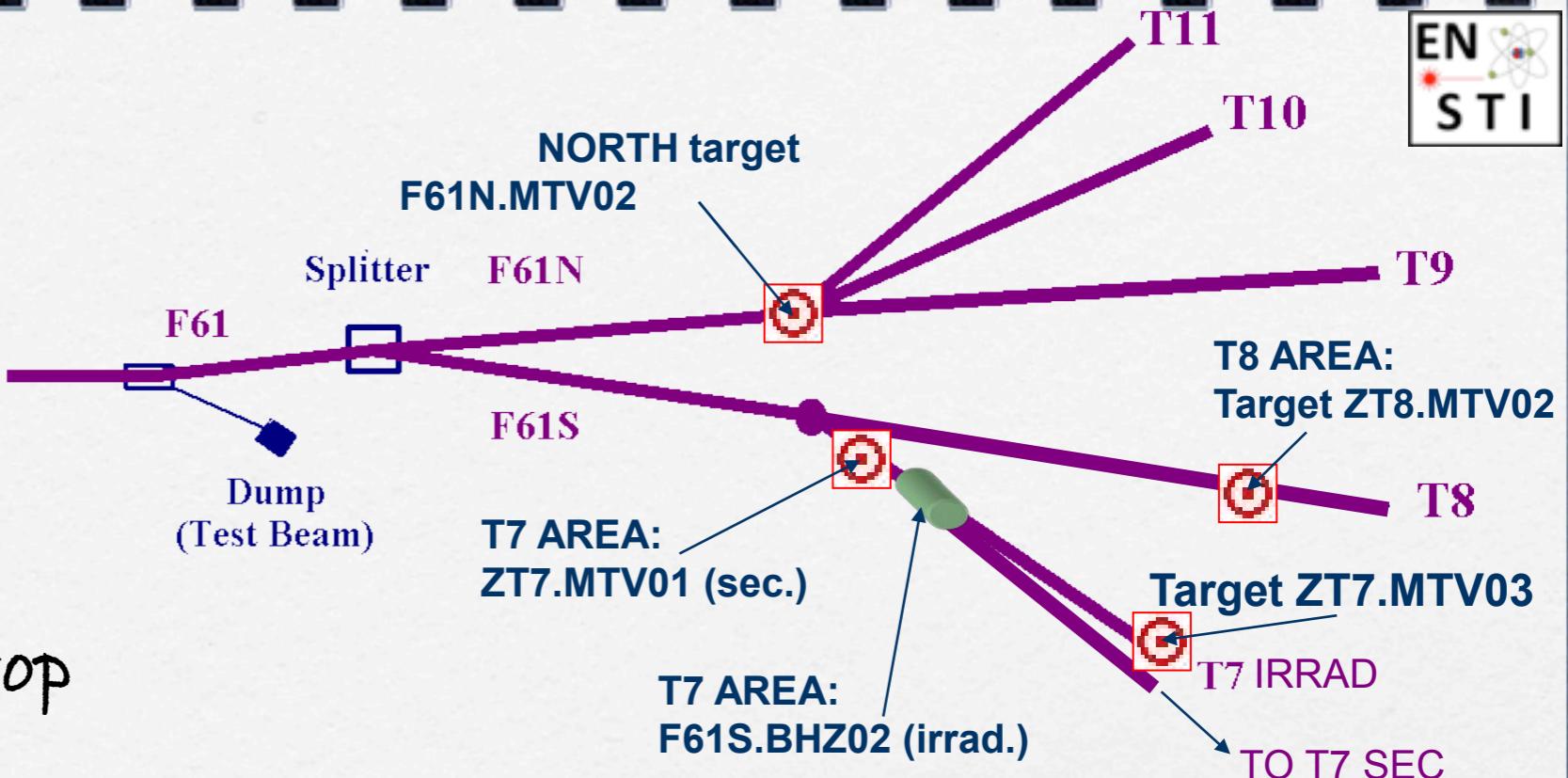
Test beam facilities @ CERN



- The North Area is the test beam area fed by the SPS
- The East Area is connected to the PS

East Area

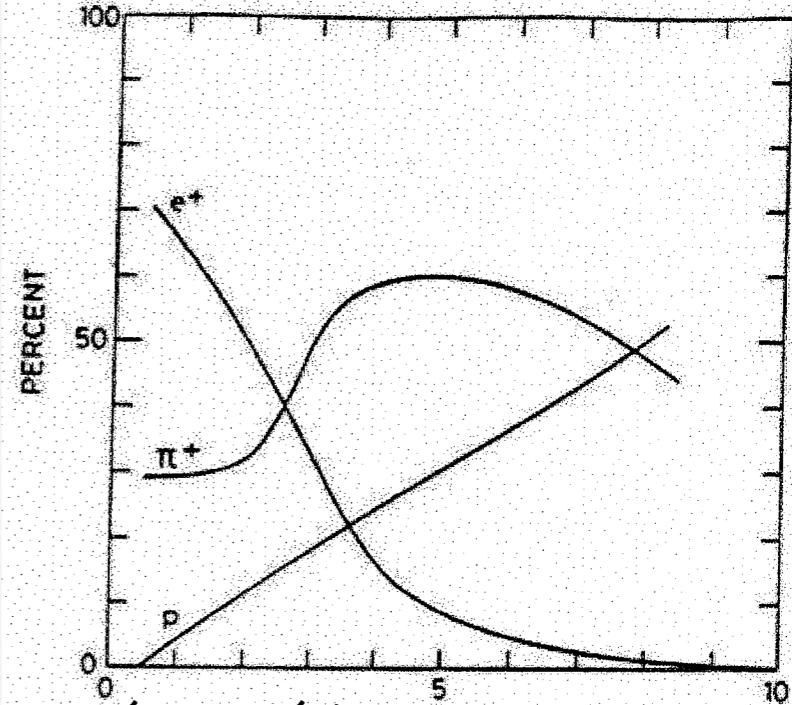
- Particle from the 24 GeV/c PS beam:
- 2.4 s cycles (flat top ~ 400 ms)
- cycles shared between "NORTH" and "SOUTH" areas
- more information:
<http://gatignon.web.cern.ch/gatignon/EastArea/>



	Particles	Momentum	Angle
T7	secondary	10 GeV/c	0
T8	primary (DIRAC)	24 GeV/c	0
T9	secondary	15 GeV/c	0
T10	secondary	7 GeV/c	61.6 mrad
T11	secondary (CLOUD)	3.5 GeV/c	149.2 mrad

East Area beams

- Main limitations:
- Beams are not parallel
- Secondary particles are not separated



from the "T7 beam line guide"

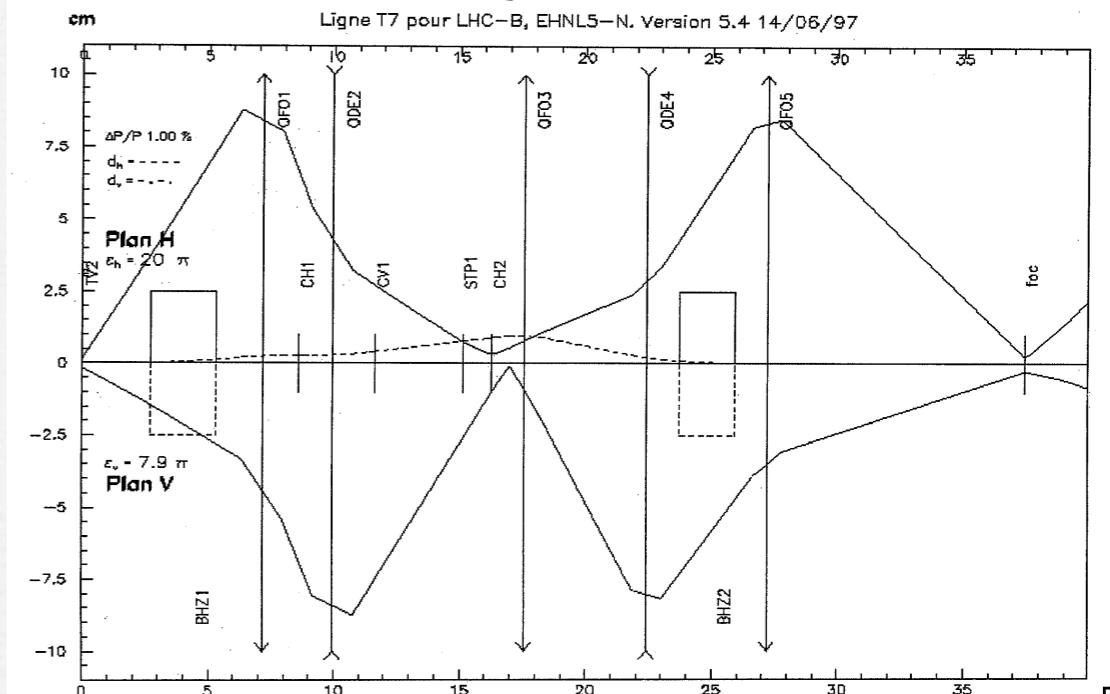
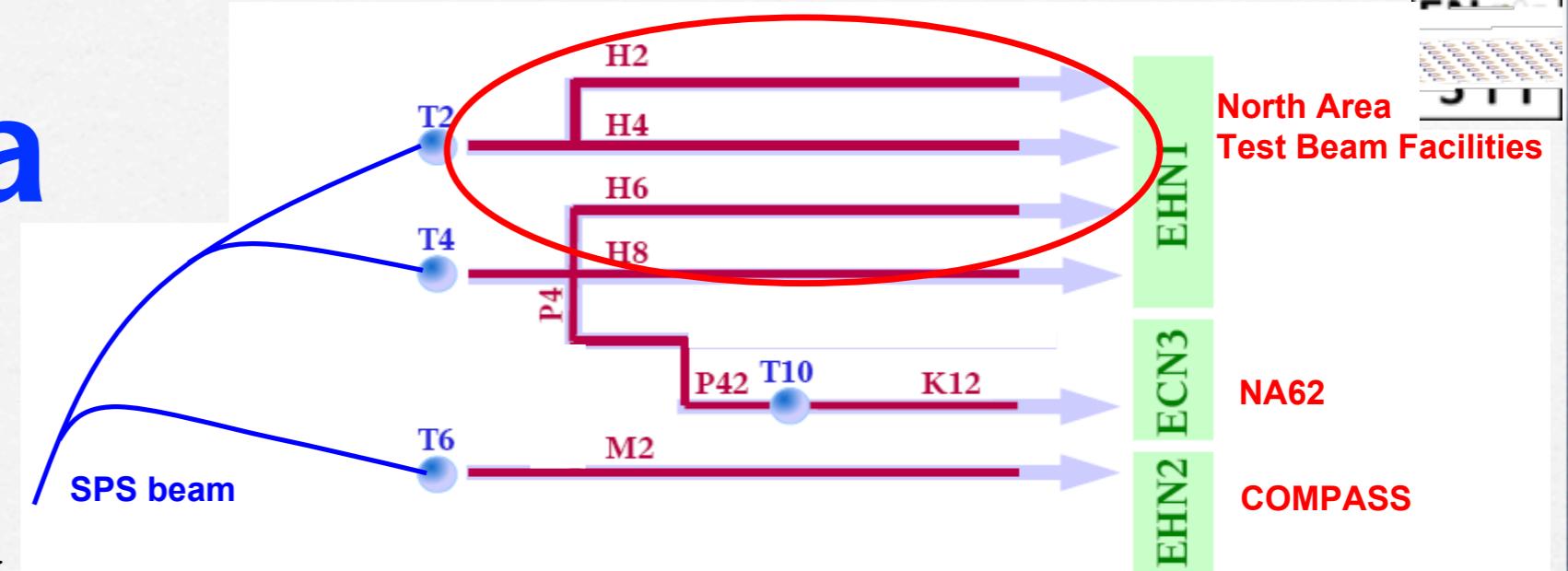


Fig 1. First order optics for the T7 line (nominal focus).

North Area

- SPS protons (ions):
- 400-450 GeV/c ($/Z$)
- 43.8 s cycle, 9 s flat top
16.3(4) s if no LHC
14.2 (4) s for ions
- full energy range:
[10, 400] GeV/c
- beams of all particle types (e, π , p, μ , Pb)
- high rates possible



	Particles	Momentum	Intensity (rad limit)
H2	secondary, tertiary	400 GeV/c max	$< 10^8$
H4	primary, secondary, tertiary	400 GeV/c max	$< 10^8$
H6	secondary, tertiary	205 GeV/c	$\sim 10^8$
H8	primary, secondary, tertiary	400 GeV/c max	$\sim 10^8$

North Area beams

	Particles	Momentum	Intensity
H2	pions (+)	200 GeV/c	9×10^7
	pions (-)	200 GeV/c	3×10^7
	electrons	150 GeV/c	$\sim 10^6$
	Pb ions	400 GeV/c/Z	$\sim 10^5$
H4	pions (+)	200 GeV/c	$9 \cdot 10^7$
	pions (-)	200 GeV/c	$3 \cdot 10^7$
	electrons	150 GeV/c	10^6
	protons (primary)	400 GeV/c	$\sim 10^7$
H6	Pb ions (primary)	400 GeV/c/Z	$\sim 10^7$
	pions (+)	150 GeV/c	10^8
	pions (-)	150 GeV/c	4×10^7
H8	pions (+)	200 GeV/c	2×10^8
	pions (-)	200 GeV/c	7×10^7
	protons (primary)	450 GeV/c	$\sim 10^7$
	Pb ions (primary)	400 GeV/c/Z	$\sim 10^6$

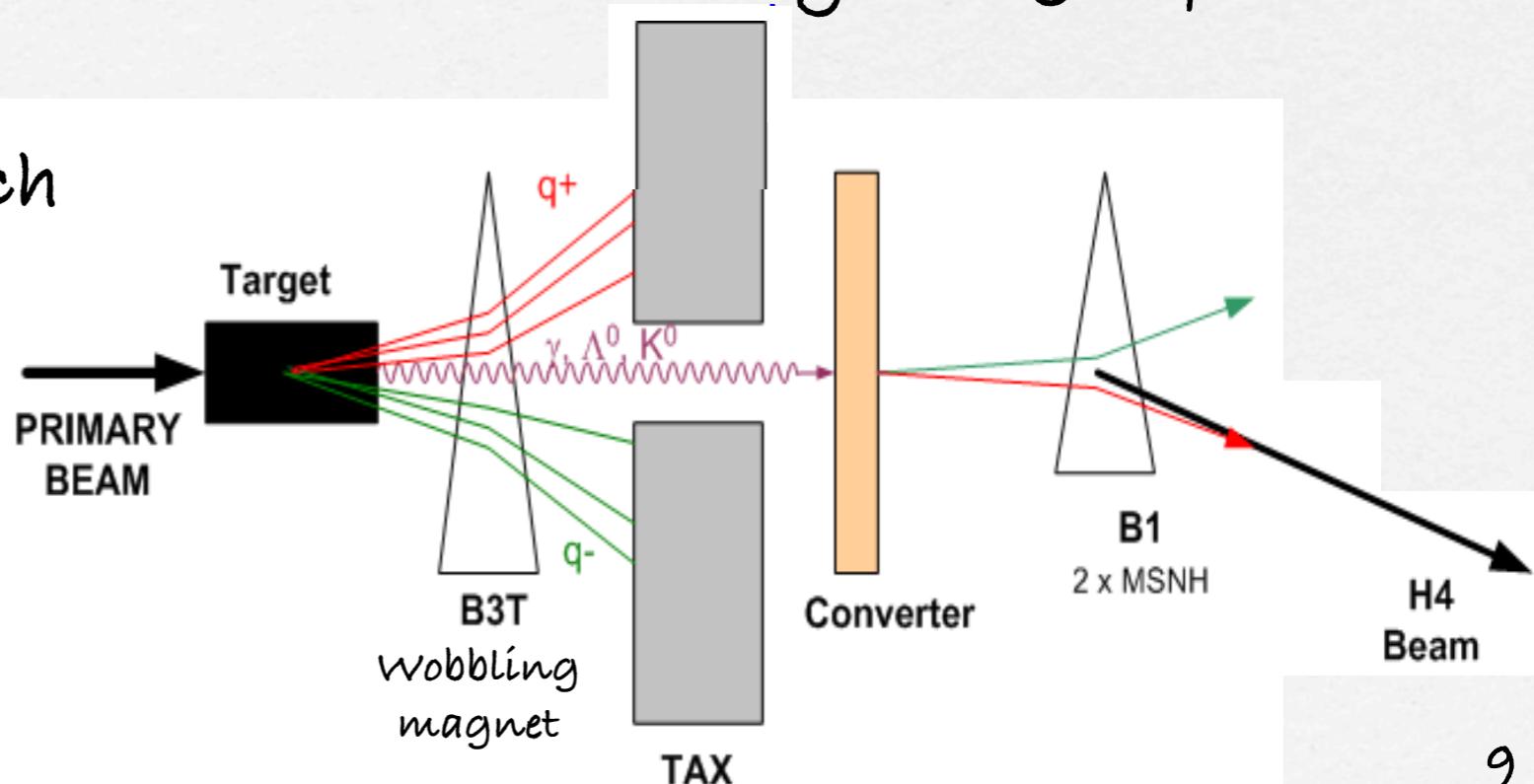
Electron production

- Secondary electrons:
 - produced at primary target
 - e/π ratio depending on target length
 - separation from hadrons by synchrotron radiation
 - contamination at low energy

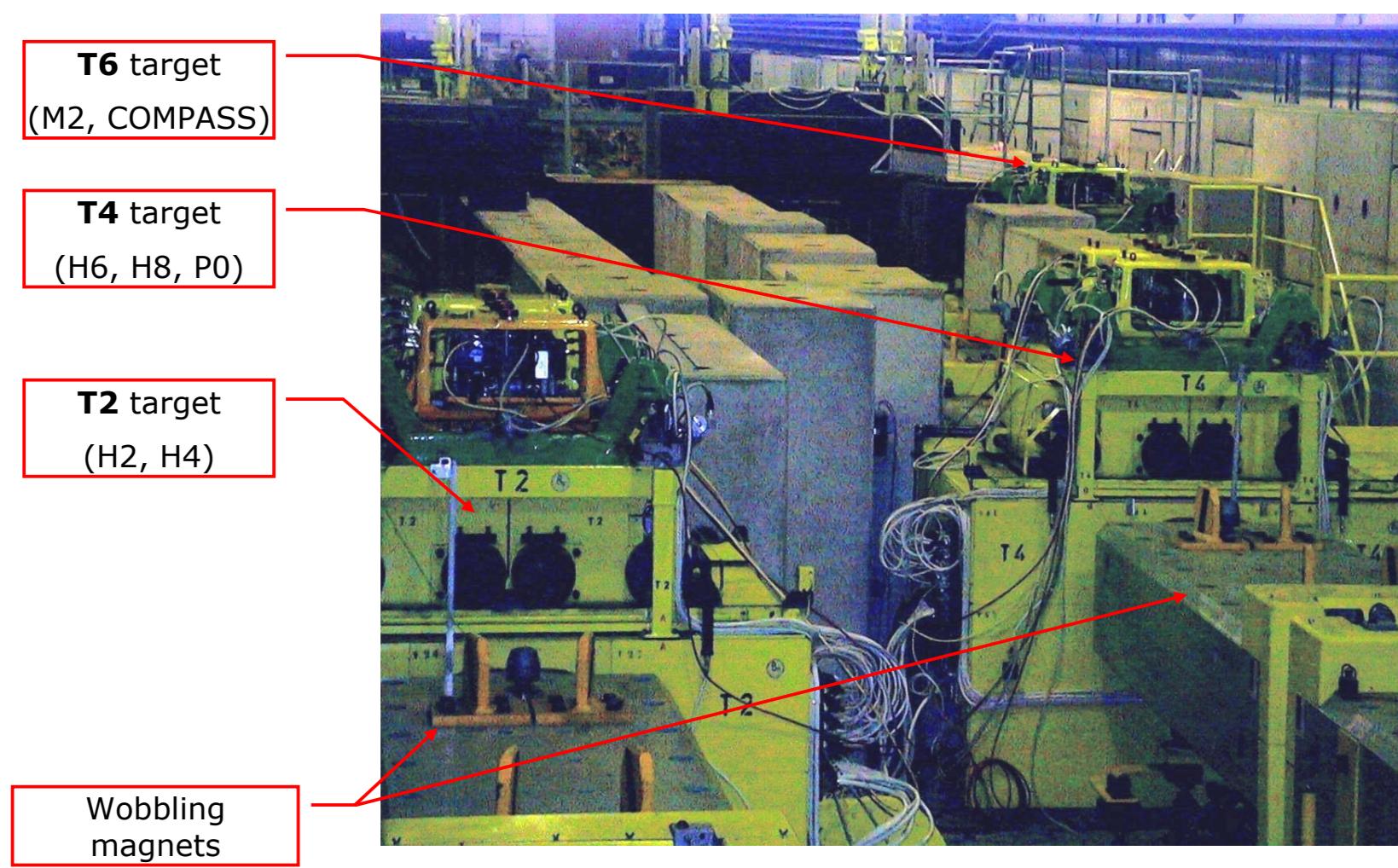
- Tertiary electrons:
 - using a second target (H8 - H6)
 - low energy, contamination
 - electrons from conversion of neutral particles (H2 - H4)
 - high purity

Tertiary particles (H4)

- Primary target: several particle are produced
- Wobbling magnet:
 - charged particles stop on the TAX
 - neutral particles reach a "converter"
 - with zero or non zero angle
- Lead converter: $\gamma \rightarrow e^+e^-$
- Air: $K^0 \rightarrow \pi^+\pi^-$ $\Lambda^0 \rightarrow p^+\pi^-$
- The first magnets of the beam select tertiary charged particles



North Area targets



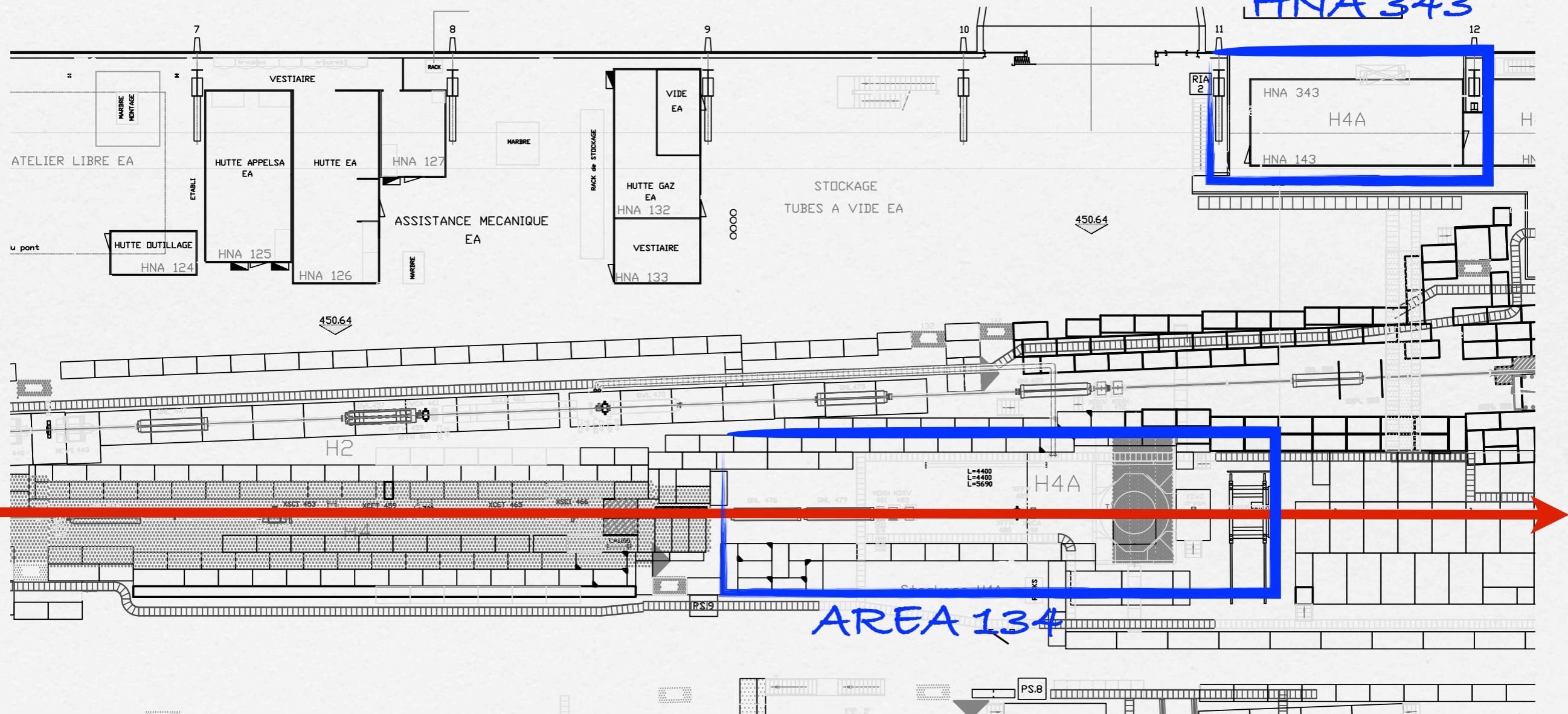
The targets

The TAX



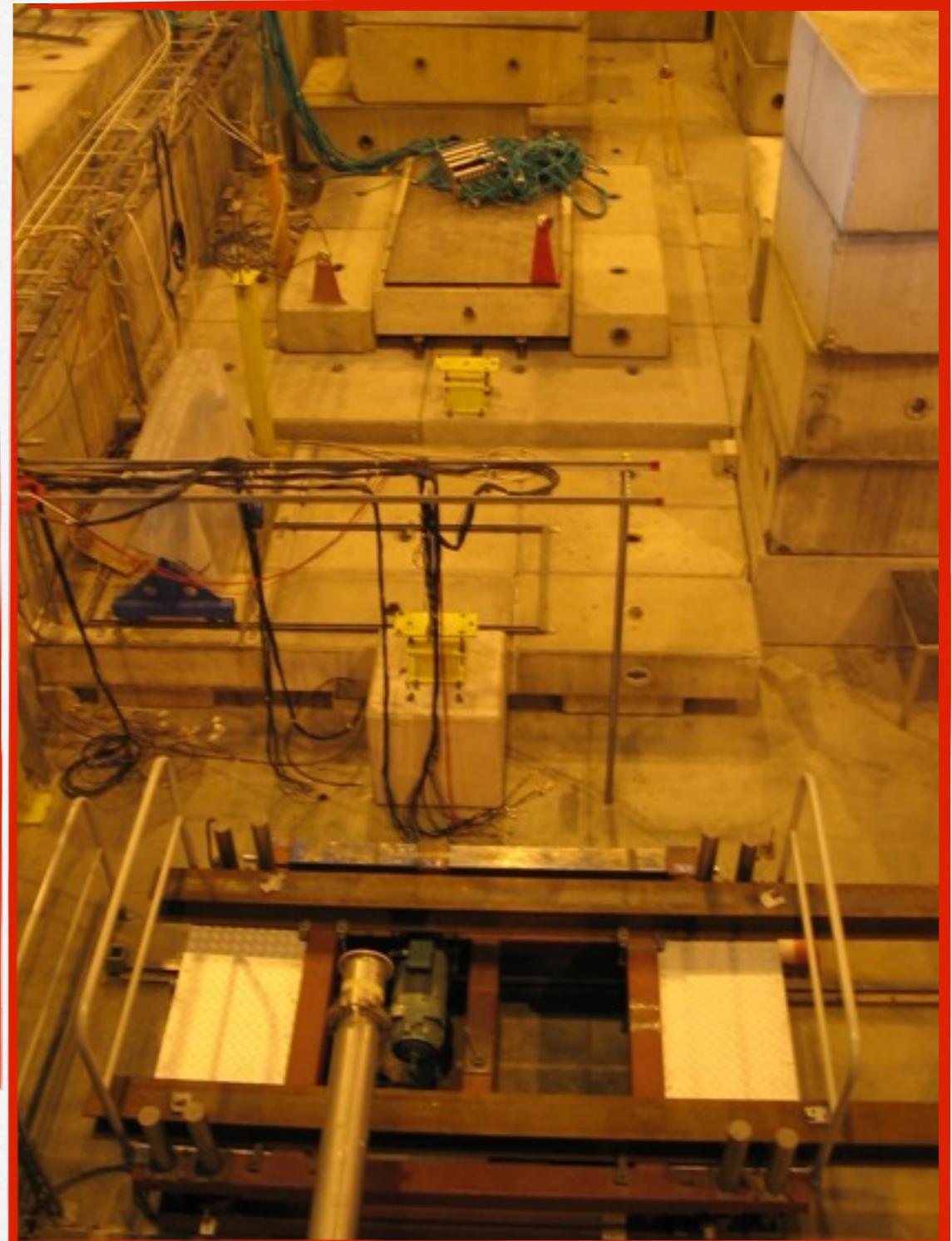
H4 beam line

Control Room



UJA
OJA

H4 beam line



Conclusion

- Electron test beam is possible in the North Area facility at CERN (H4 beam line):
 - Tertiary electrons from conversion
 - momentum up to 150 GeV
 - Intensity up to 10^6