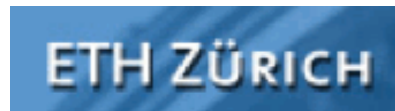


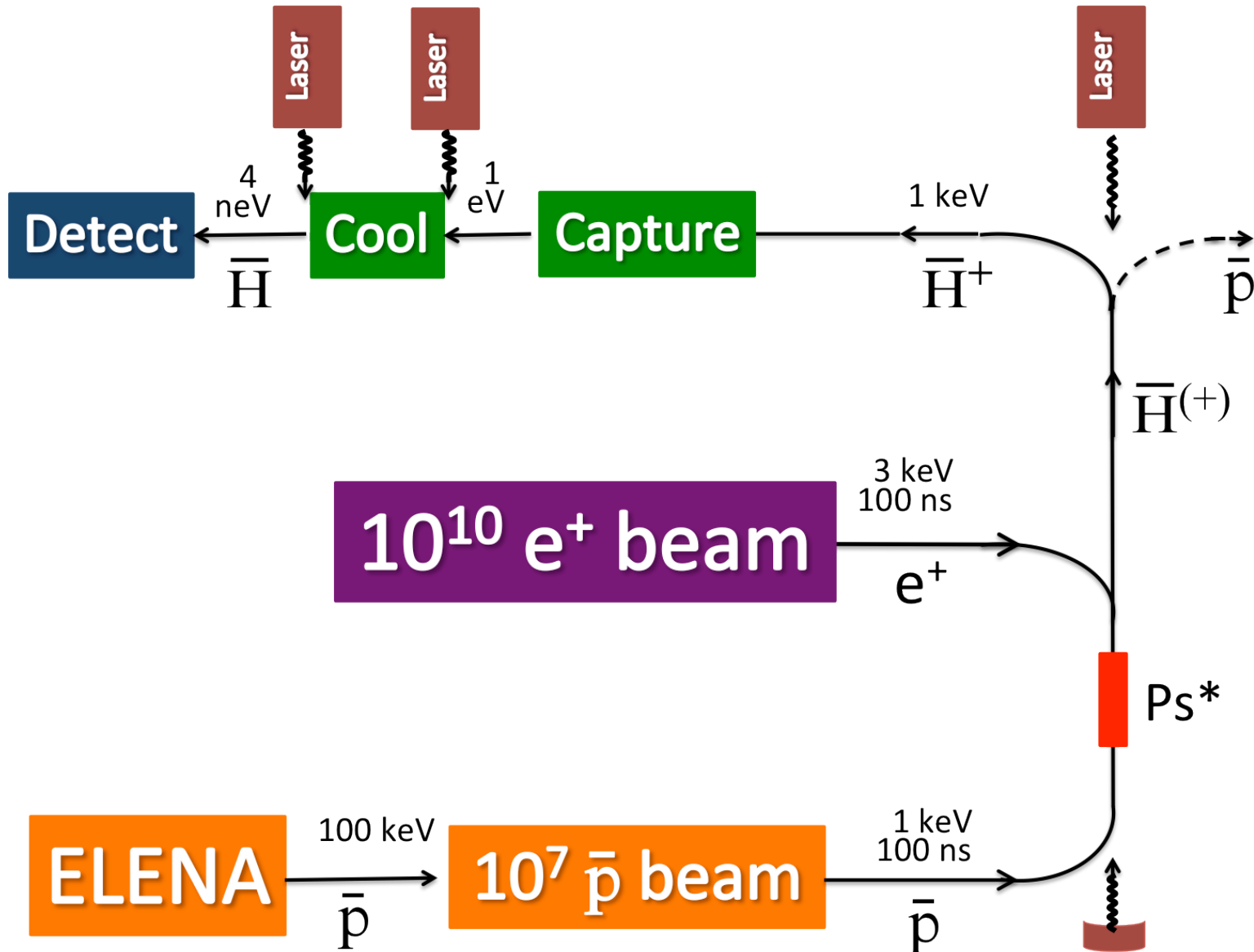
# GBAR Status

## Outline

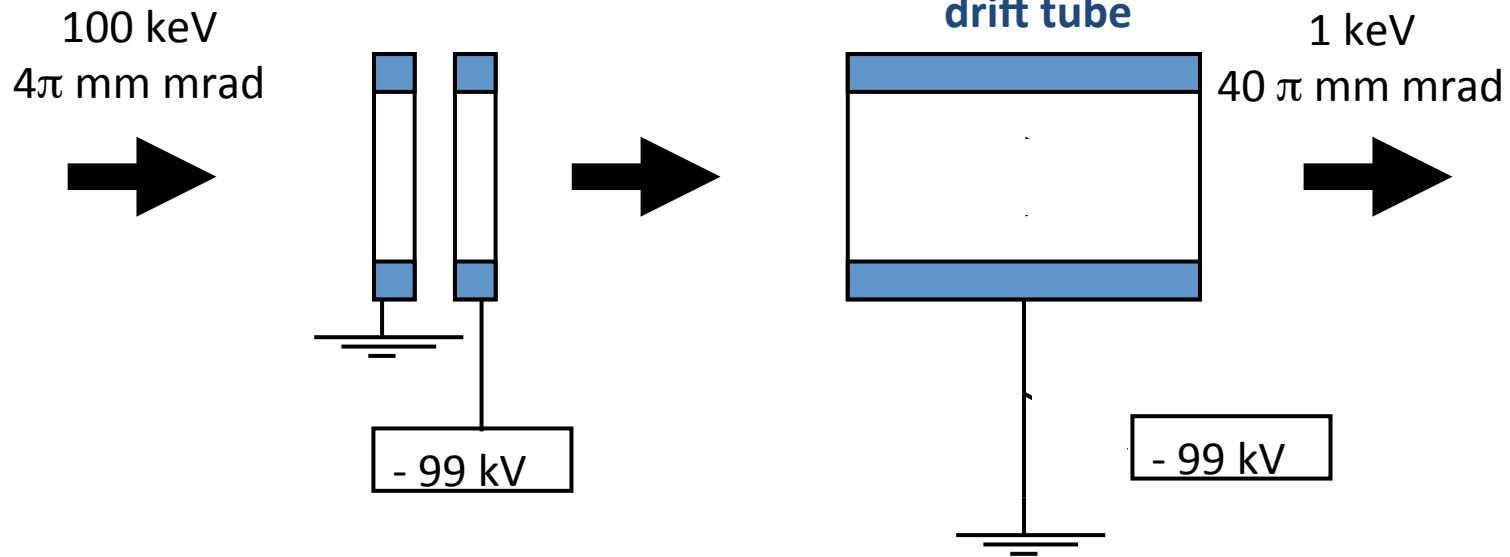
Antiproton decelerator prototype in Orsay  
e<sup>+</sup> production at Saclay  
Calculation of  $\bar{H}^+$  production  
Conceptual Design Report



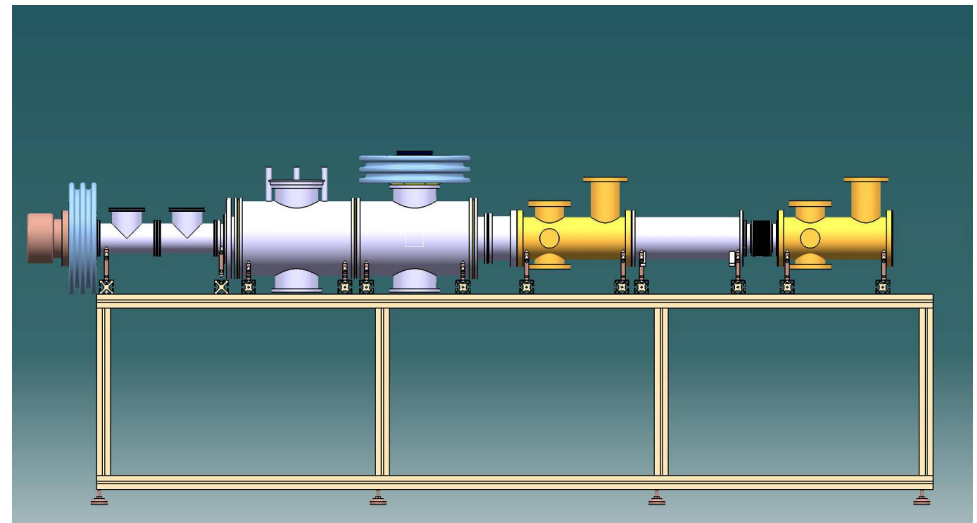
# GBAR Synoptic scheme



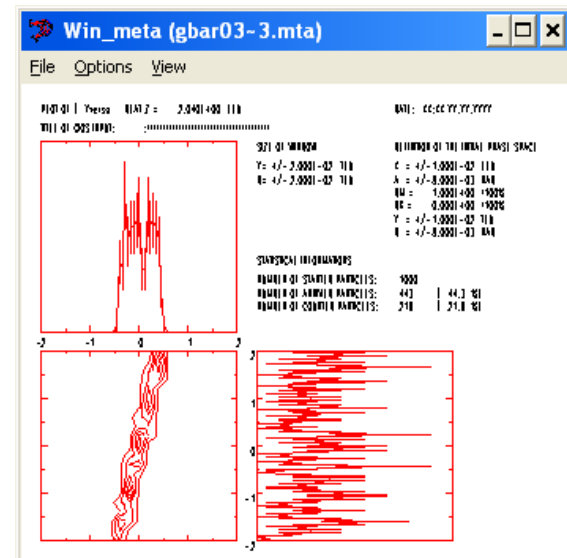
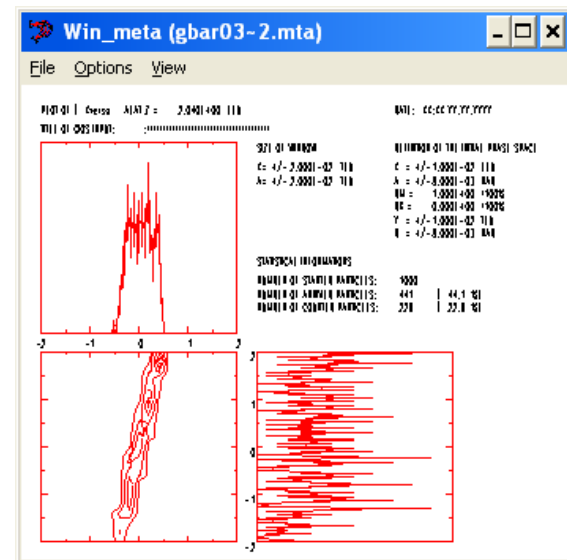
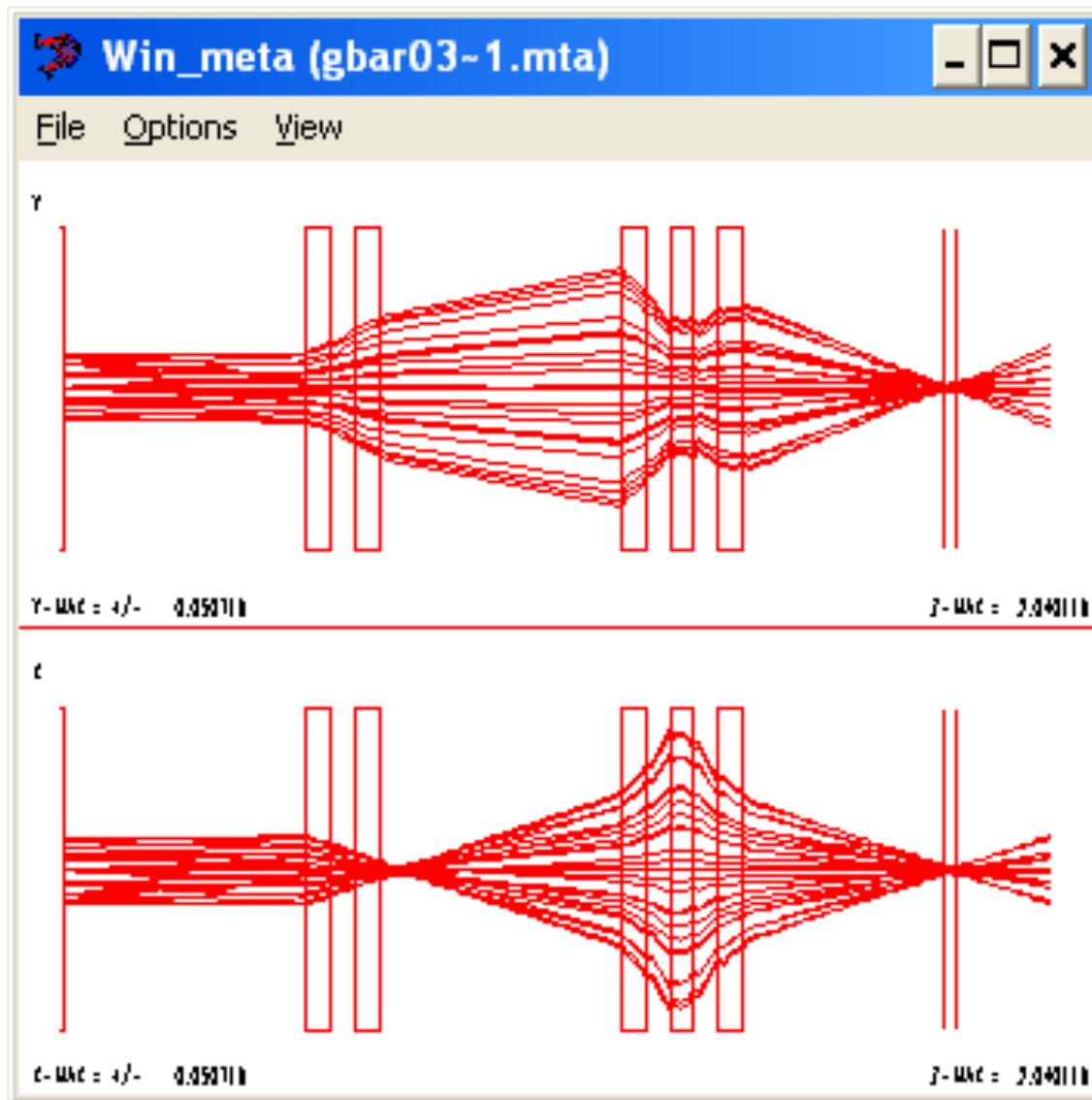
# GBAR antiproton decelerator



Talk by D. Lunney at CERN/  
BPPC meeting on 27/09/2012



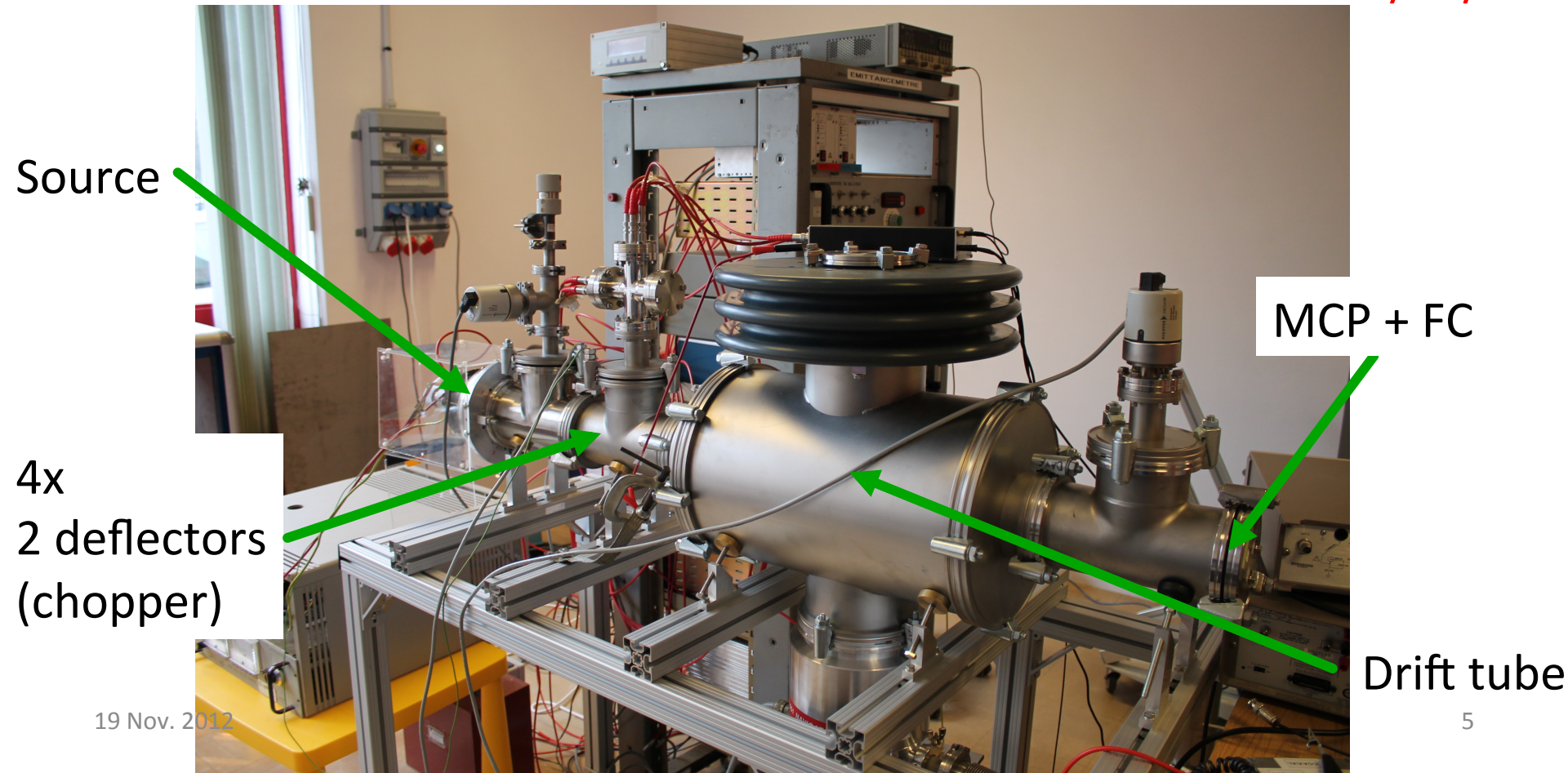
# transport to Ps reaction chamber (GIOS)



# Status at Orsay

- Started testing at 5 kV with nitrogen
- Next: hydrogen at 100 kV, 100 ns bunches ( $10^6$ - $10^7$  protons)

First Run: 16/11/12



# Conclusions: GBAR requirements for ELENA beam

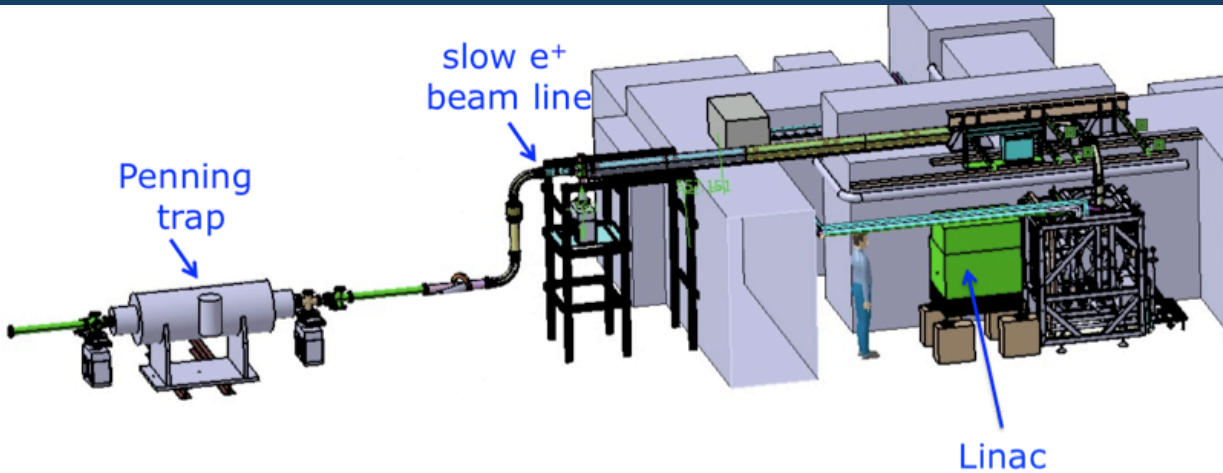
## Transverse beam properties

- Focusing into 1-mm by 20-mm (Ps) tube: tricky but  $4\pi$  mm mrad OK
- Run in pulsed mode (bunches of  $5 \times 10^7$  ions) OK

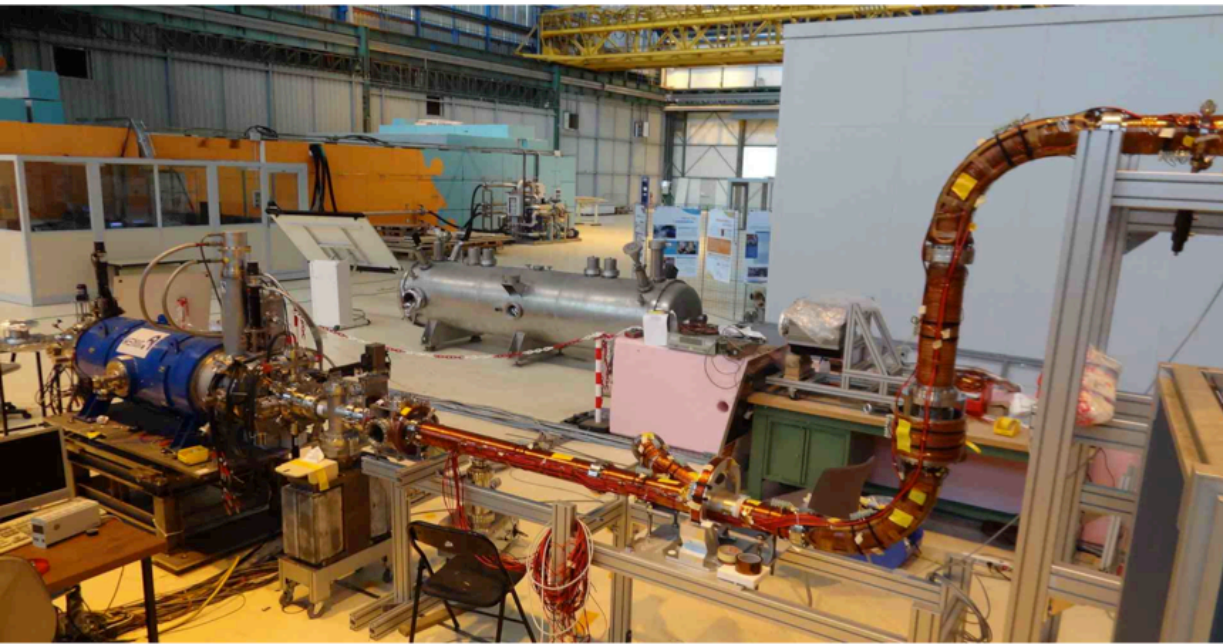
## Longitudinal beam properties

- 300-ns bunch length OK
- momentum spread of ELENA beam very important:  
 $10^{-4}$  OK but  $10^{-3}$  has serious (negative) consequences...

# $e^+$ /Ps demonstrator at Saclay



- 4.3 MeV / 200 Hz / 2.5  $\mu$ s / 120  $\mu$ A
- $3 \cdot 10^6$  slow  $e^+$ /s
- with first W mesh moderator
- Penning trap on beam line (from RIKEN)
- First trapping trials



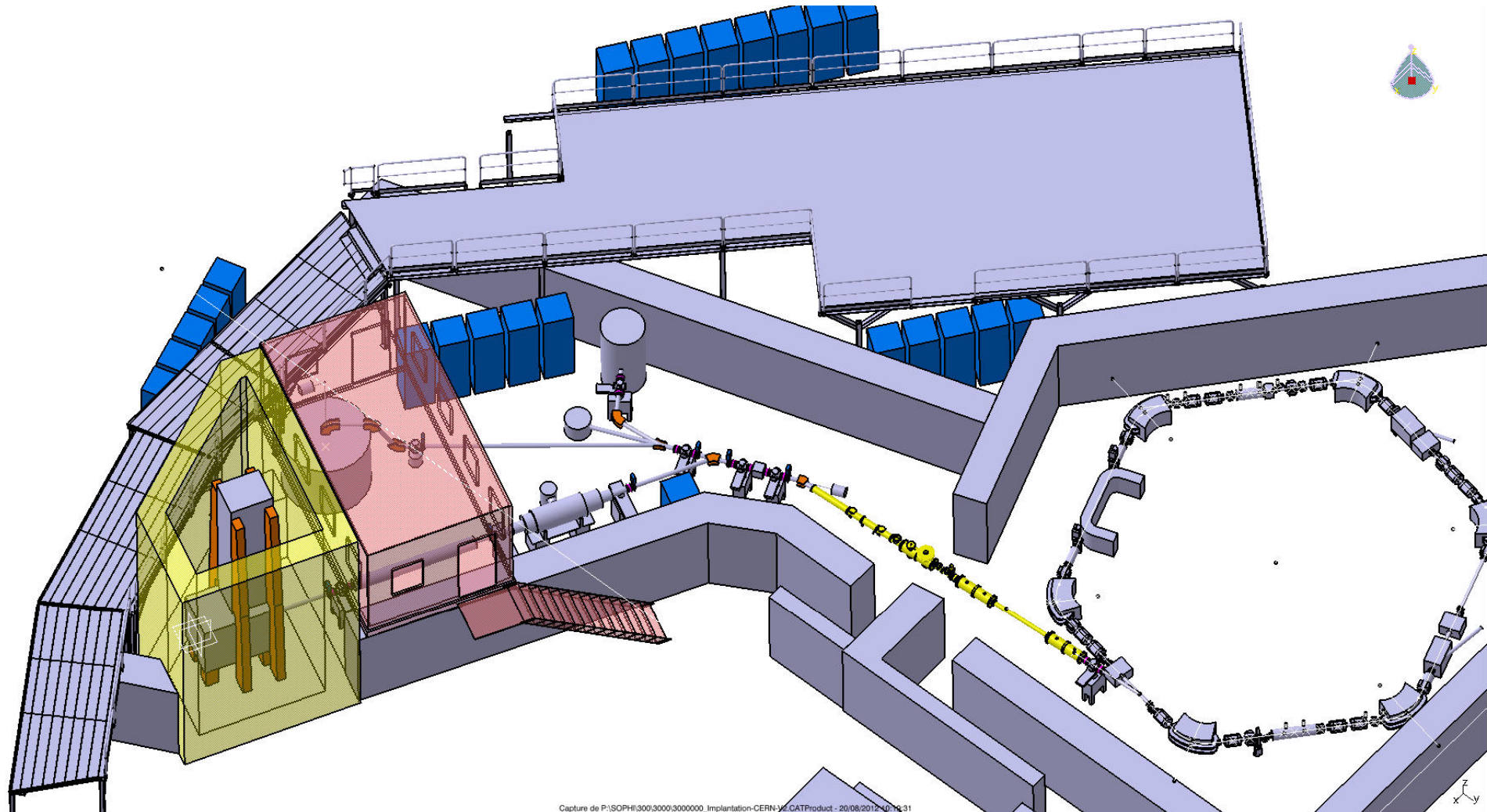
- Secondary beam line
- $\rightarrow$  moderator developments
- $\rightarrow$   $e^+$ /Ps converters
- Ps\* laser being prepared at LKB (Paris)

# Electron linac for $e^+$ source

- NCBJ finished study of 18-20 MeV electron linac
- NCBJ will produce an 18 MeV linac in 2013
  - test elements for GBAR linac
- If funding found: install linac at CERN in 2014-2015



# First iterations on Layout



Capture de P:\SOPHI\300\3000\3000000\_Implantation-CERN\3D\CATProduct - 20/08/2012 10:15:31

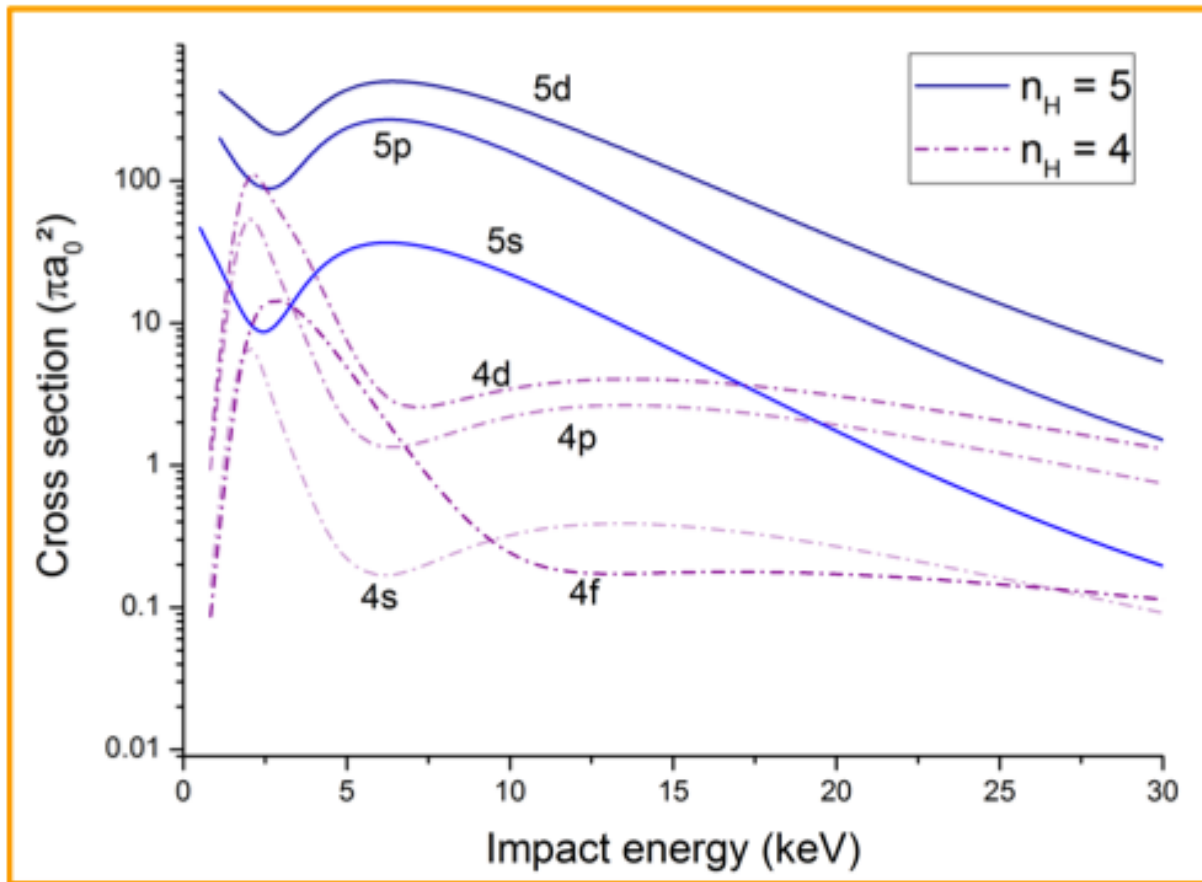
# Calculation of $\bar{H}^+$ production



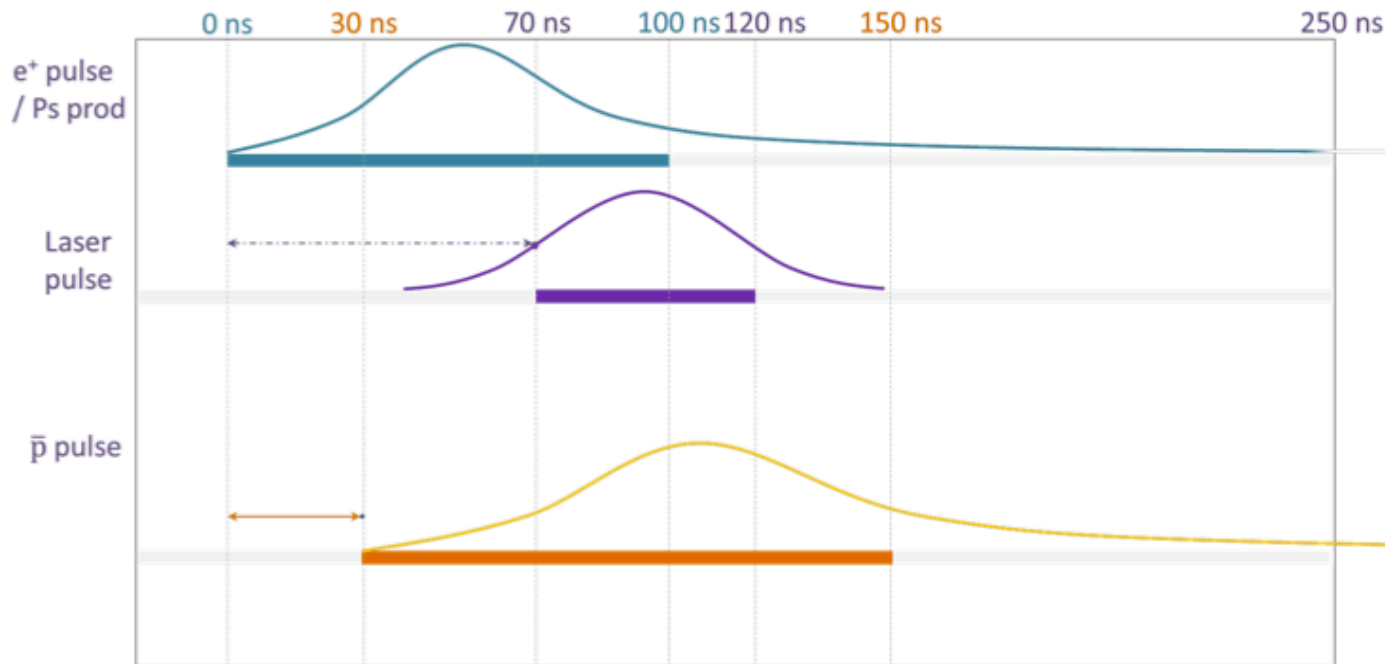
$\bar{H}^+$  production optimal from  $\bar{H}(1s) + Ps$

But first reaction produces excited states

→ tradeoff



# Calculation of $\bar{H}^+$ production



Playing with  $\bar{p}$ ,  $e^+$  and laser pulses (length, delay) and Ps cloud length

→ 3  $\bar{H}^+$  produced (1 detected) per pulse for 1-6 keV  $\bar{p}$  seems easily feasible, i.e. proposal x 7

→ Could further improve!

# Other activities

- Conceptual Design Report
- MoU