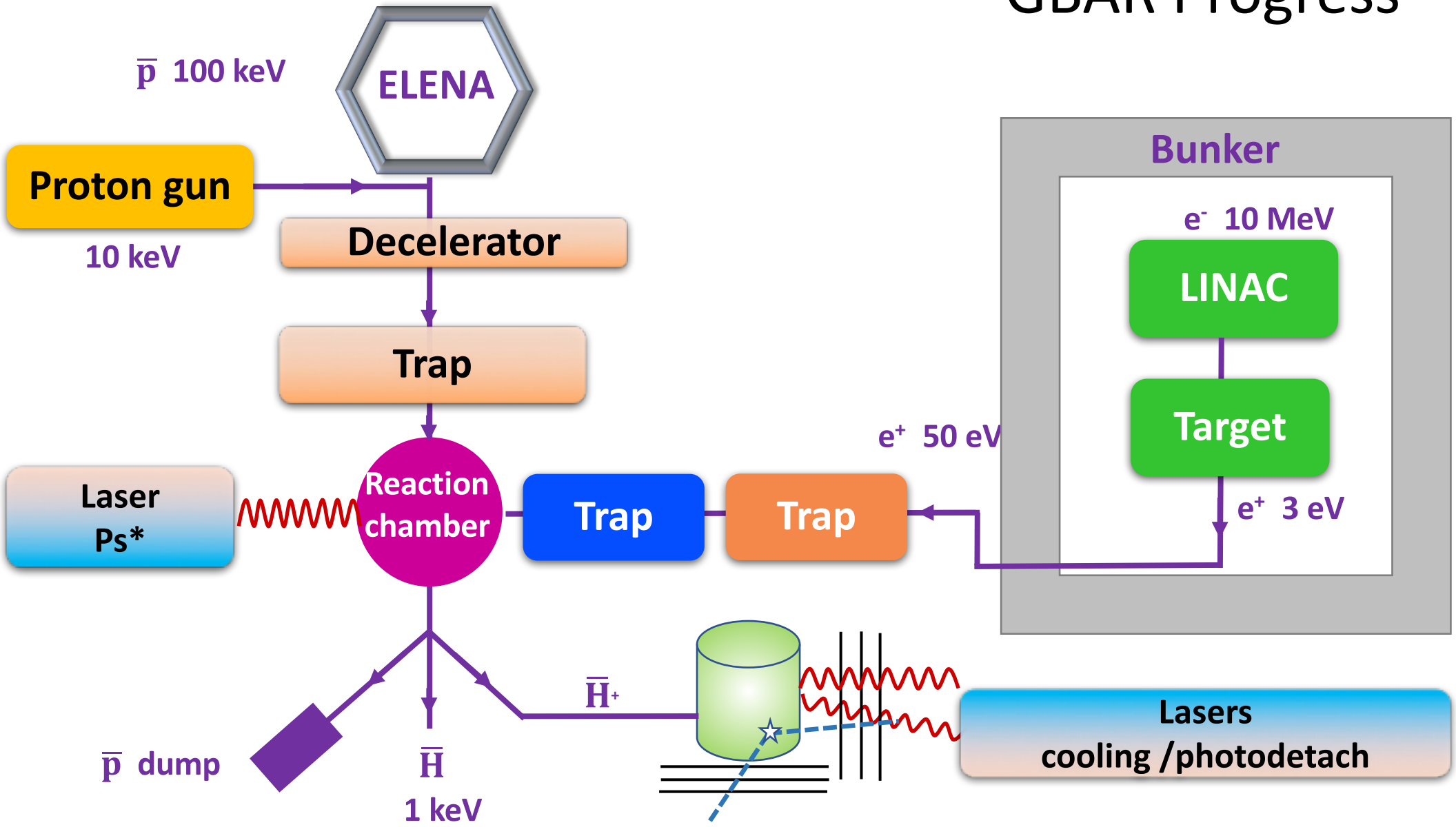
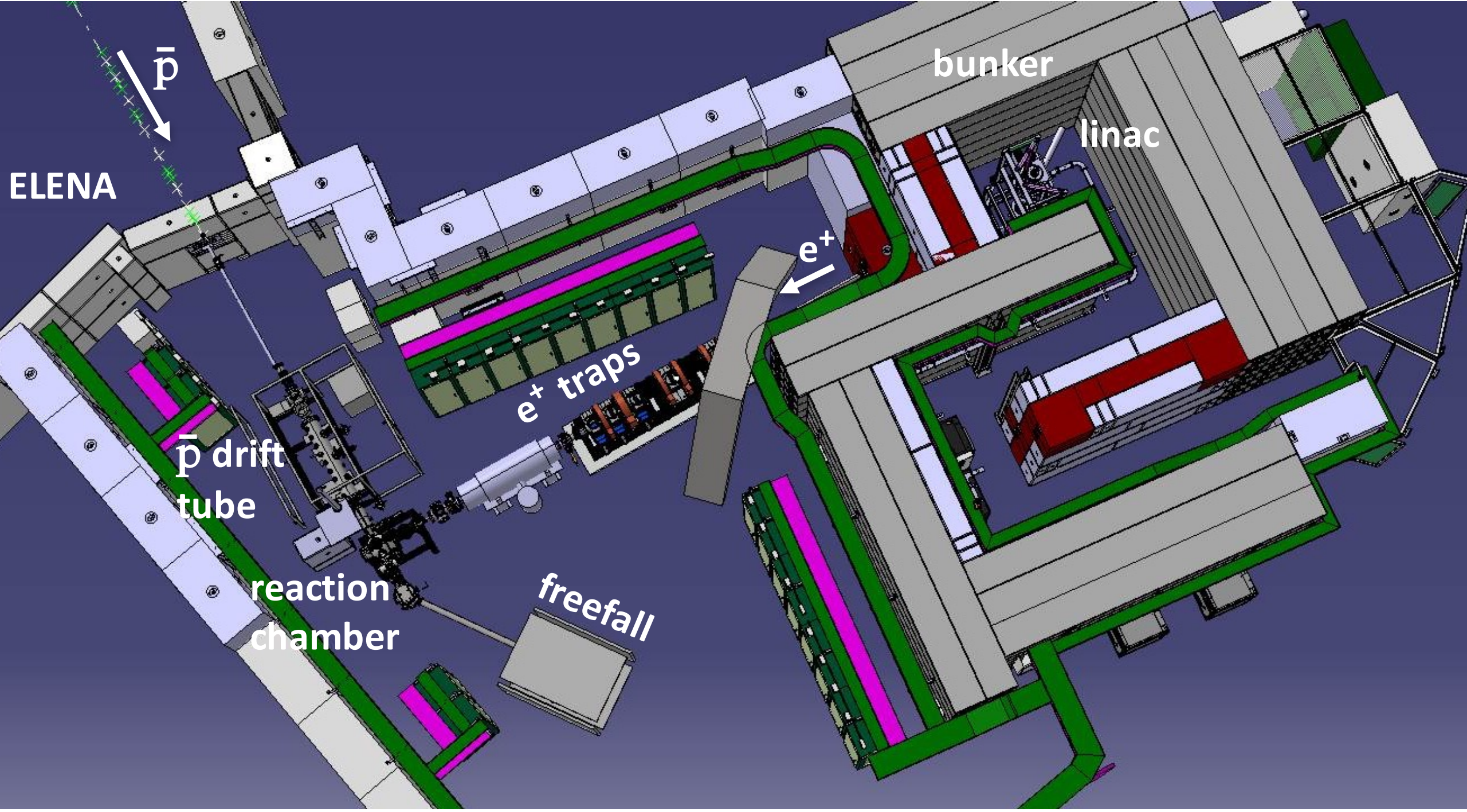
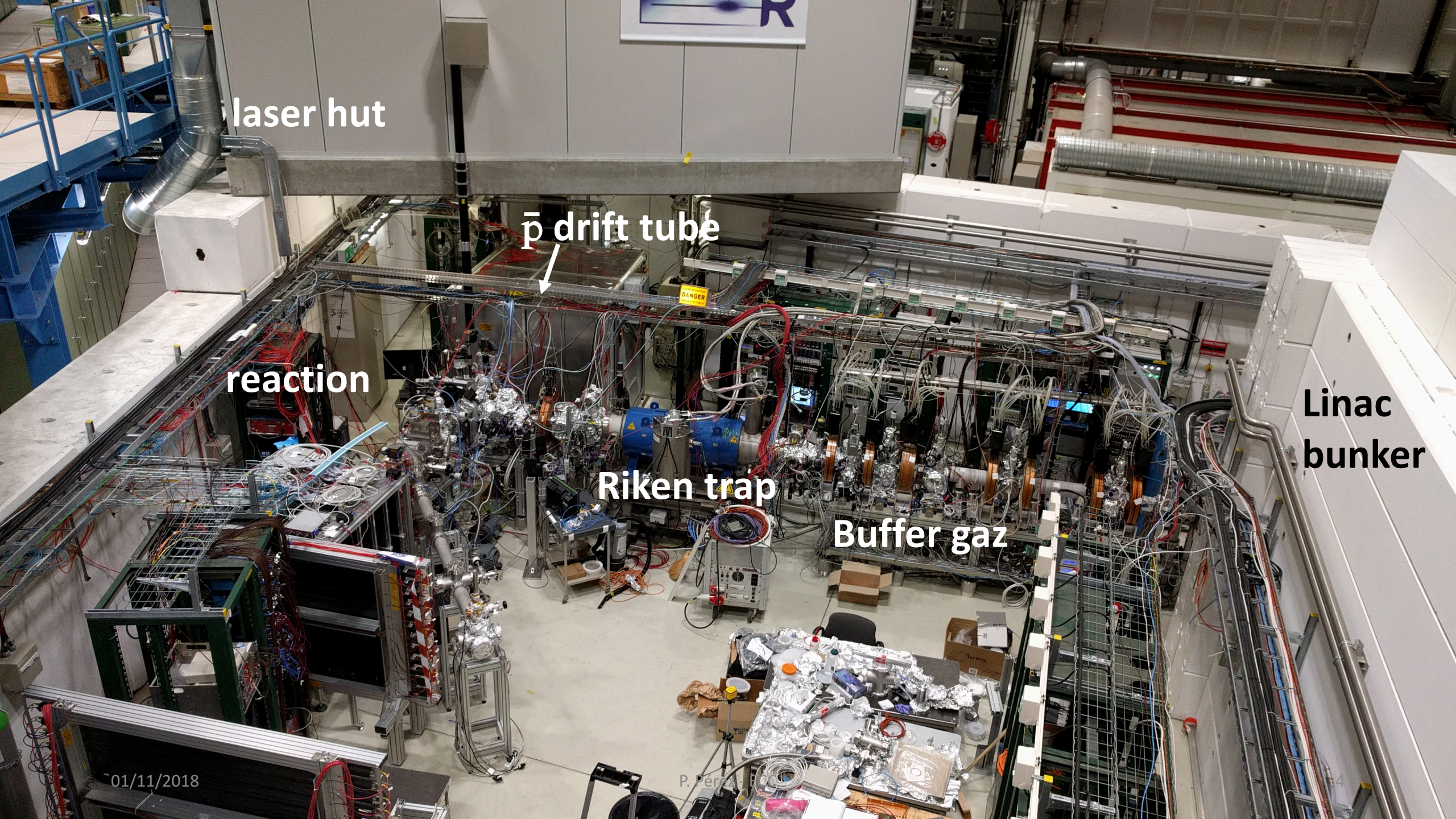
GBAR Progress

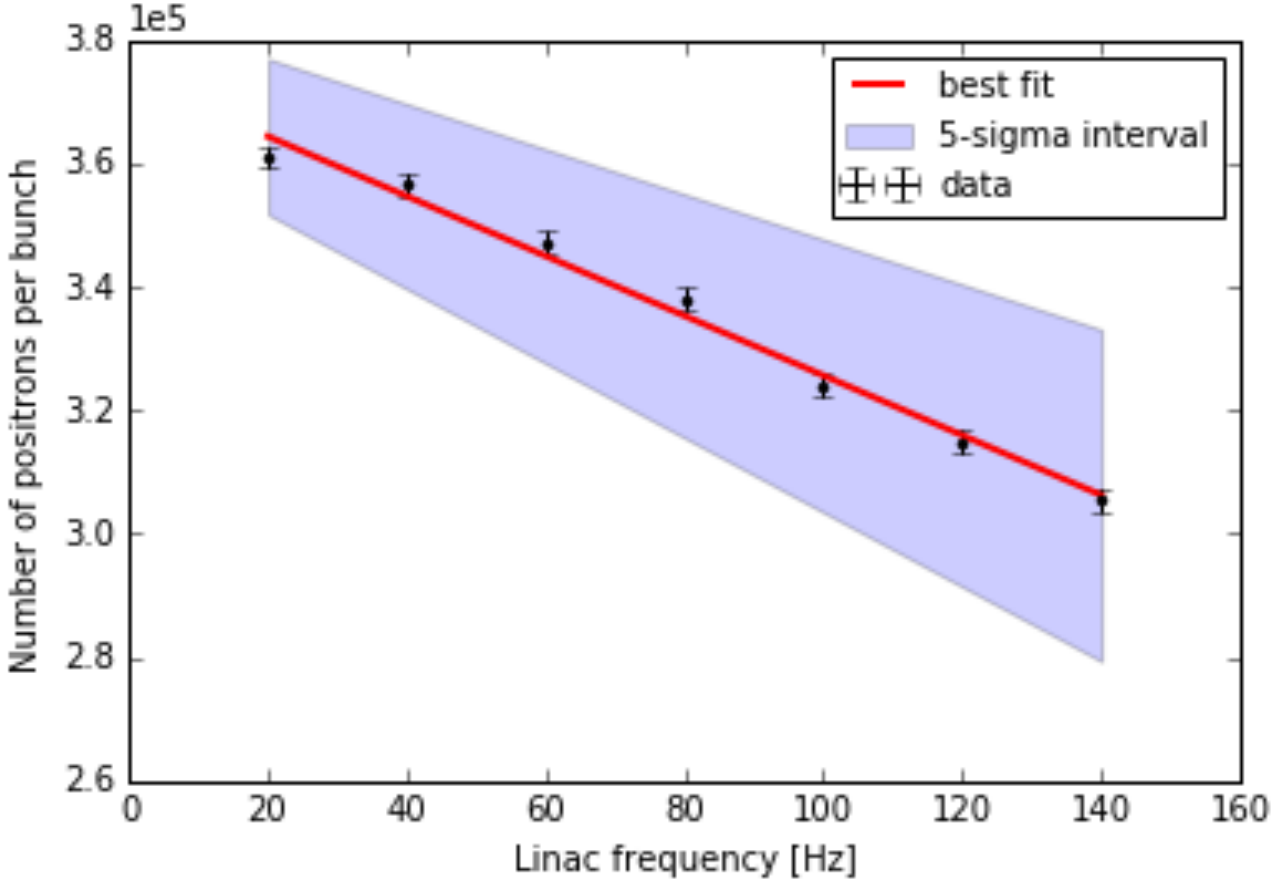



$\bar{p}$
ELENA
bunker
linac
e^+
e^+ traps
$\bar{p}$ drift tube
reaction chamber
freefall


March 2017


laser hut
$\bar{p}$ drift tube
reaction
Riken trap
Buffer gaz
Linac
bunker

Positrons

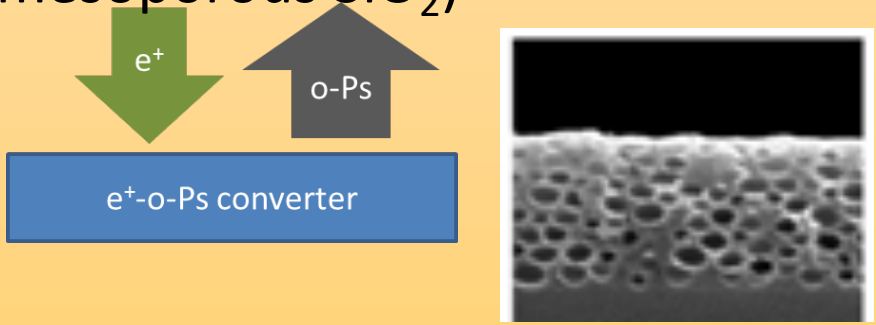


- 3×10^5 e^+ / pulse
- extrapolation to 300 Hz → 7×10^7 e^+ / s
- will improve moderation (x 2 ?)
- goal 3×10^8 e^+ / s

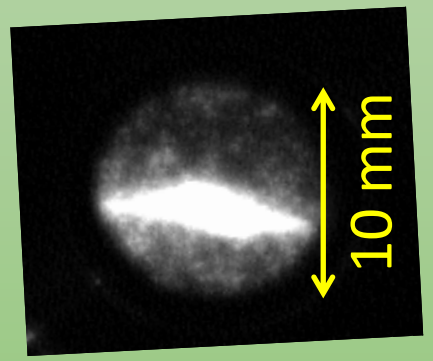
- Today trapping few 10^7 -10^8
- goal 10^{10}

ortho-positronium signal

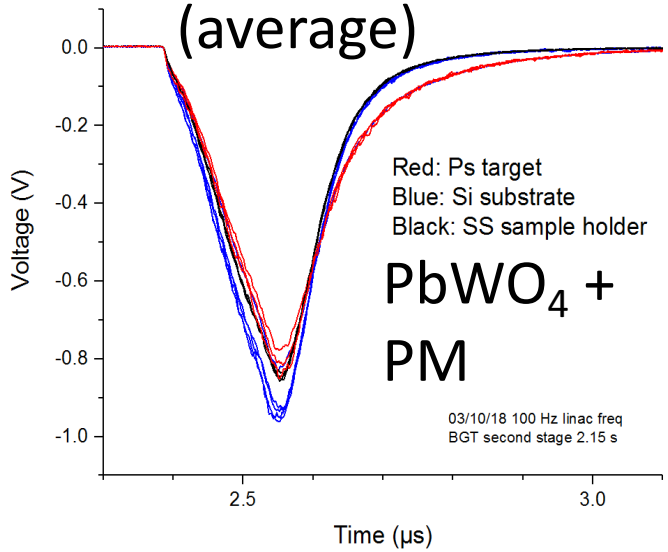
Positron-positronium converter (mesoporous SiO_2)

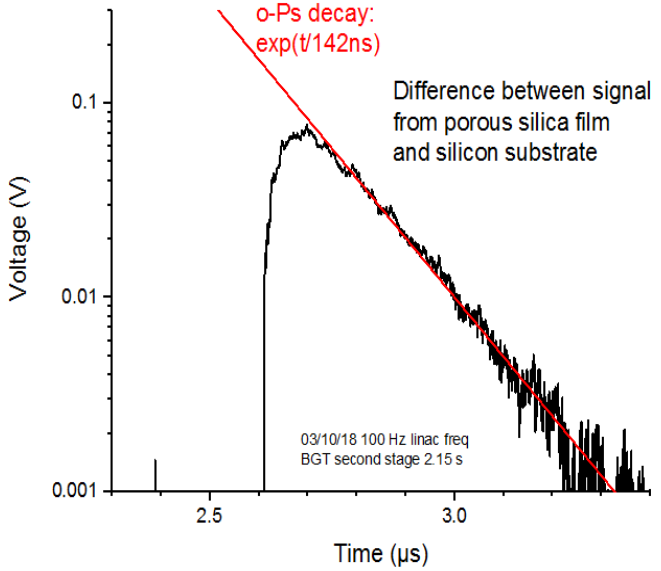


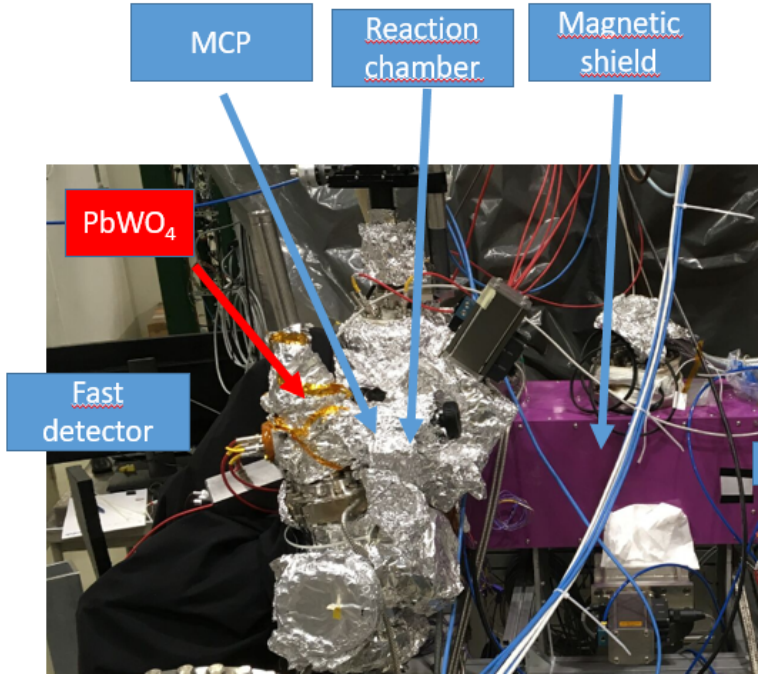
Positron beam spot on the target



Raw signal (average)

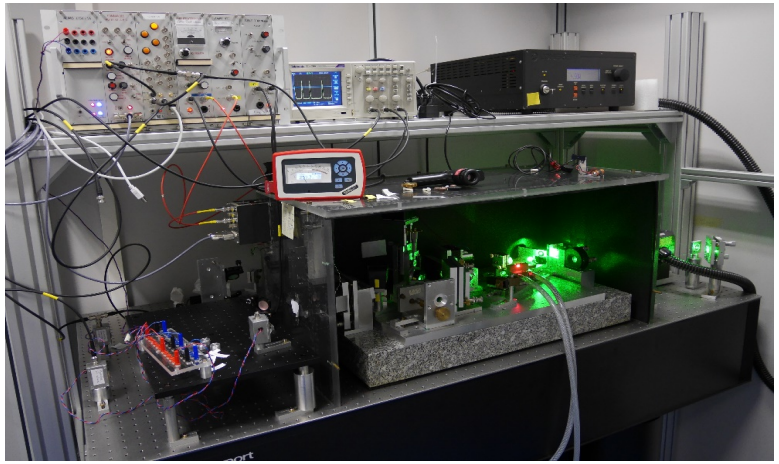




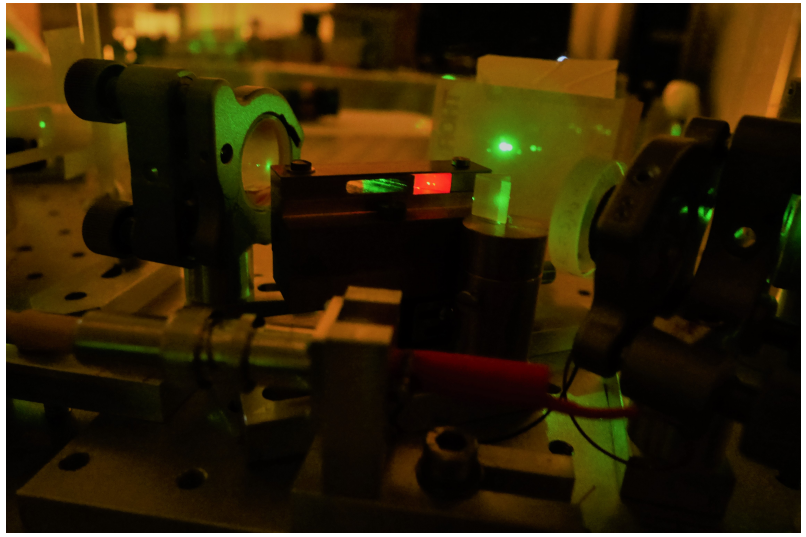


Differential signal showing oPs lifetime

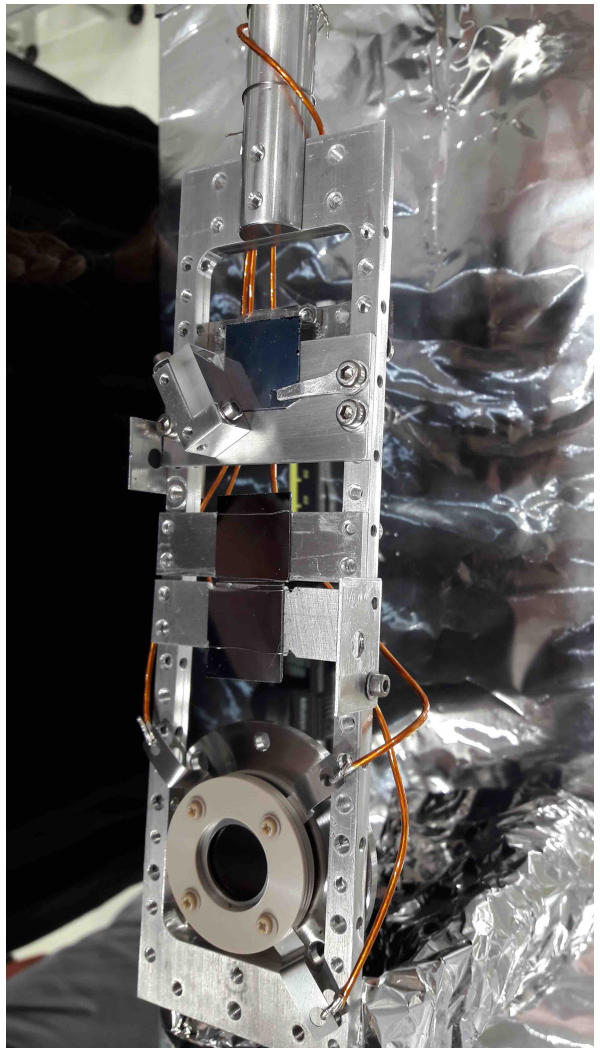
Ps excitation laser



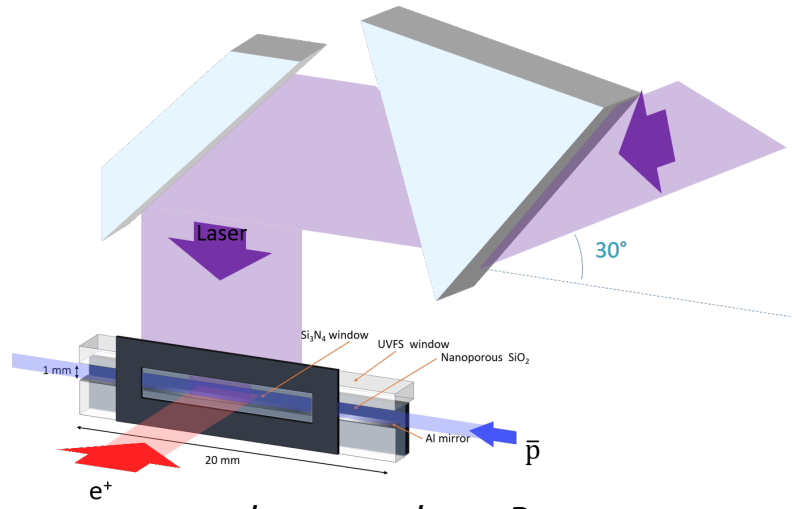
CW TiSa seeder, 260 mW at 820 nm



TiSa oscillator, >5 mJ at 820 nm



sample holder, MCP, mirror



beam paths to Ps target

CW TiSa seeder and oscillator

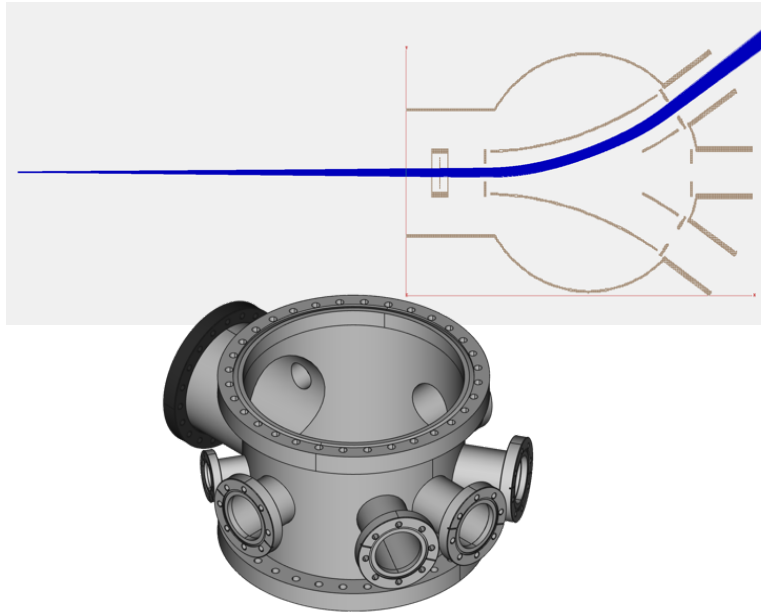
cavity 5 mJ @ 820 nm

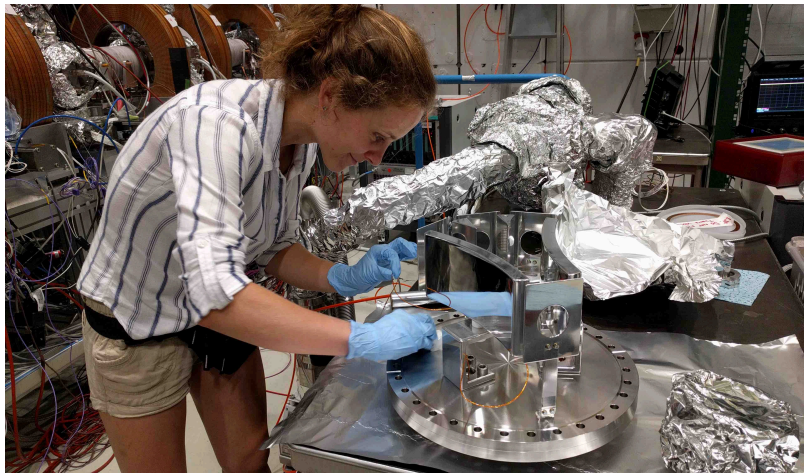
after ampli 26 mJ

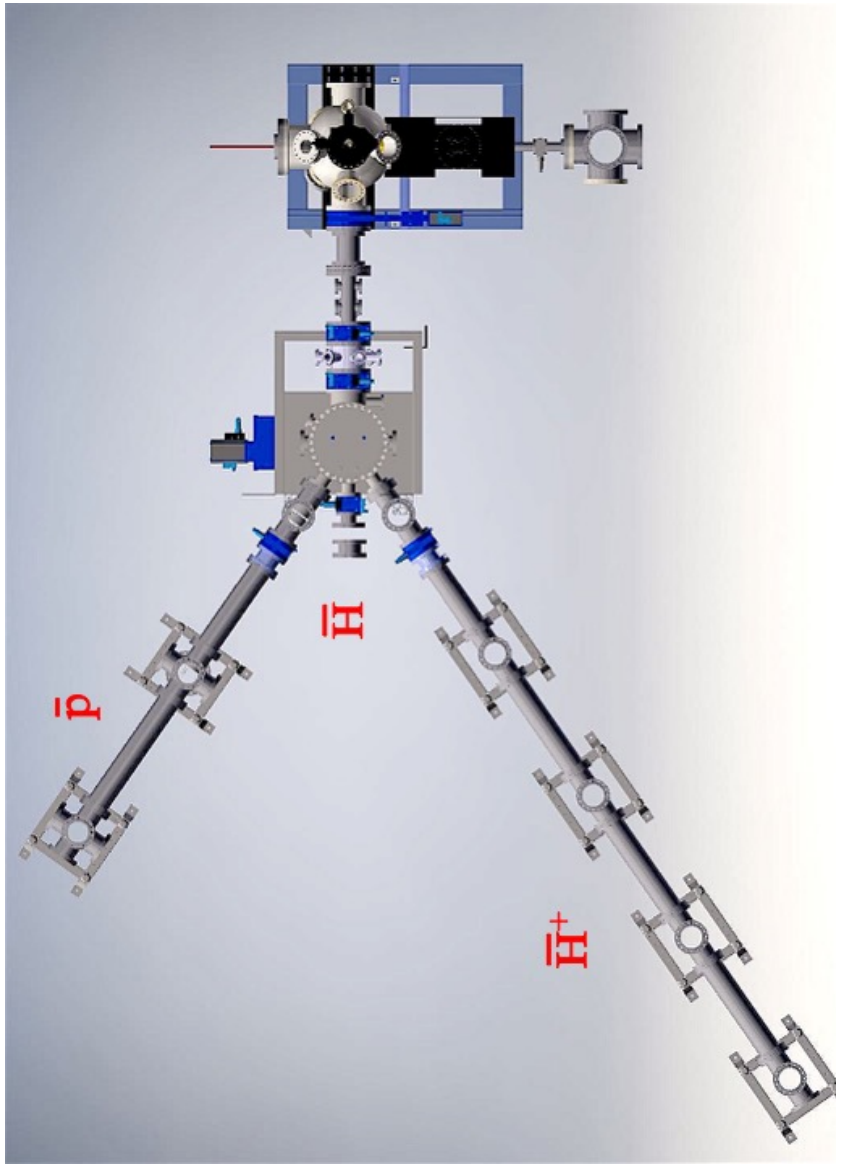
goal 10 mJ @ 410 nm

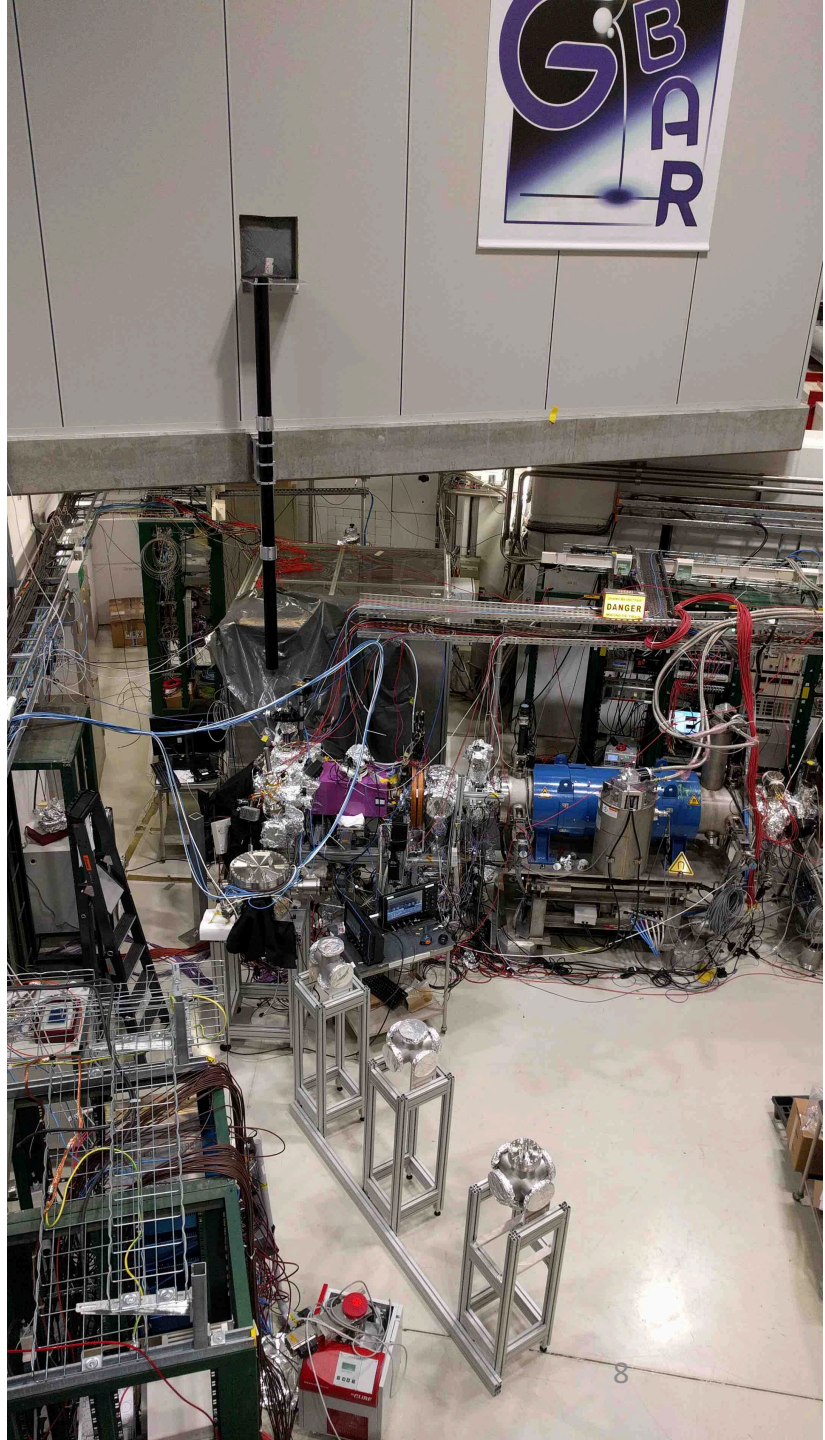
<u>Plan 2018</u>: look for 1S-3S transition

Beam distribution

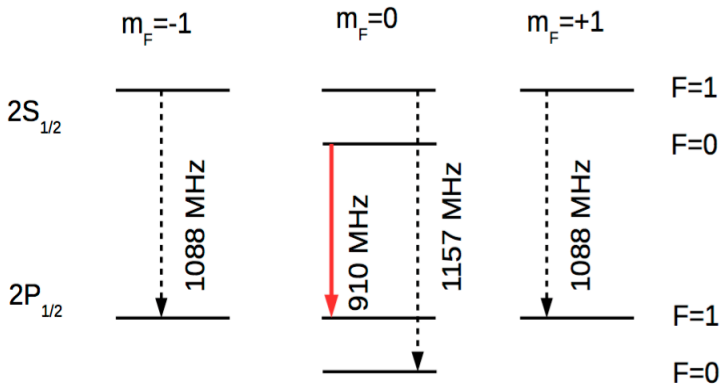


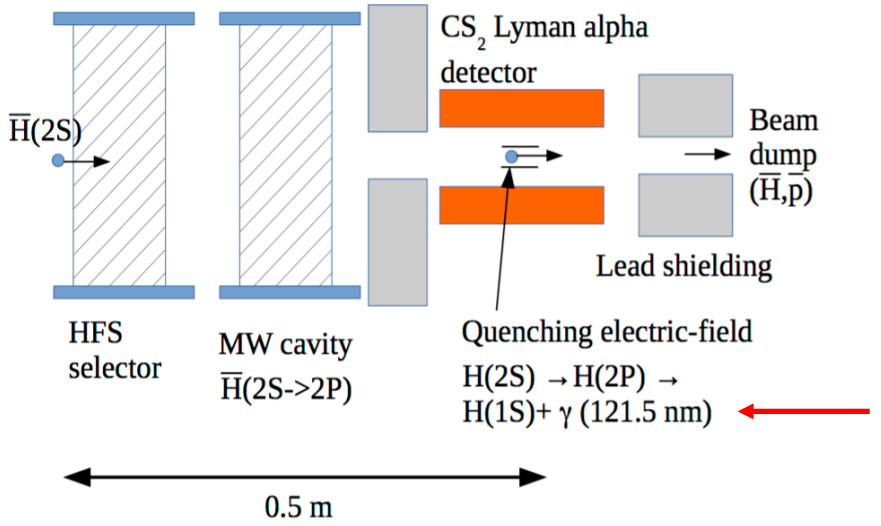






$\bar{H}$ Lamb shift



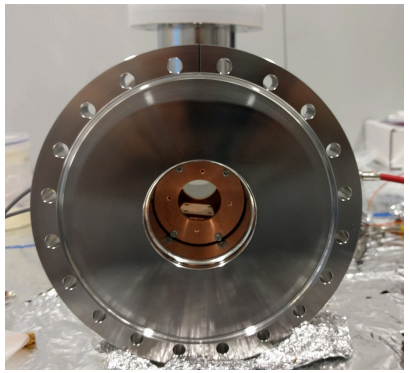


detect those γs

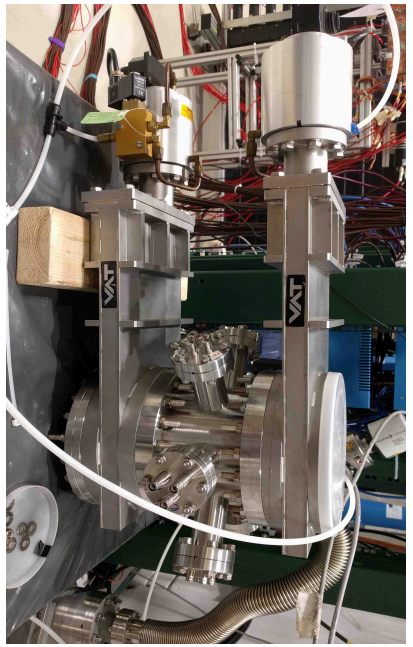
Measure quenched fraction as a function of microwave frequency

4 months data → 100 ppm on line center

$$\Delta E = \frac{1}{12}\,\alpha^4 m_r^3 r_p^2$$ → 10% on $\bar{p}$ radius



microwave cavity



CS_2 coated MCPs

GBAR Progress

Our goal for 2018 is to produce antihydrogen

All beam lines, are installed to this aim

Linac is working (1/3 nominal power, commissioning to be achieved before end 2018)

We get presently 10^8 positrons trapped, not yet focused to the intersection region with $\bar{p}$

With 3 10^6 antiprotons going through the positronium target, we should get ~ 1 $\overline{H}$ per pulse

Extracting beam from ELENA and focusing to GBAR in progress ← SEM start working

But… we have no more beam time allocated ...