

Danish  
**HSSIP**  
2021, CERN

*Antimatter*

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*& A. Schomerus*

ALPHA  $\alpha$

# About ALPHA



Antihydrogen Laser PHysics  
Apparatus



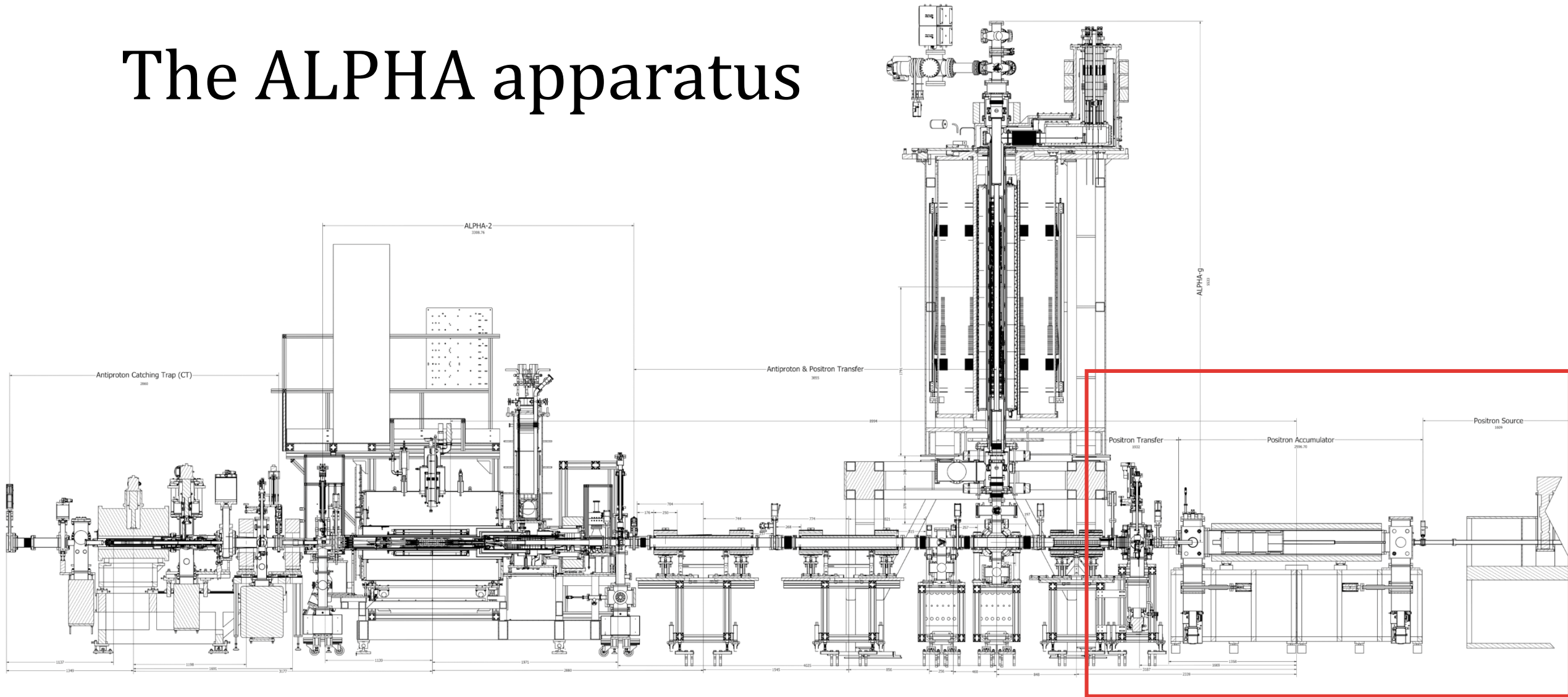
Synthesizing and trapping  
antihydrogen atoms



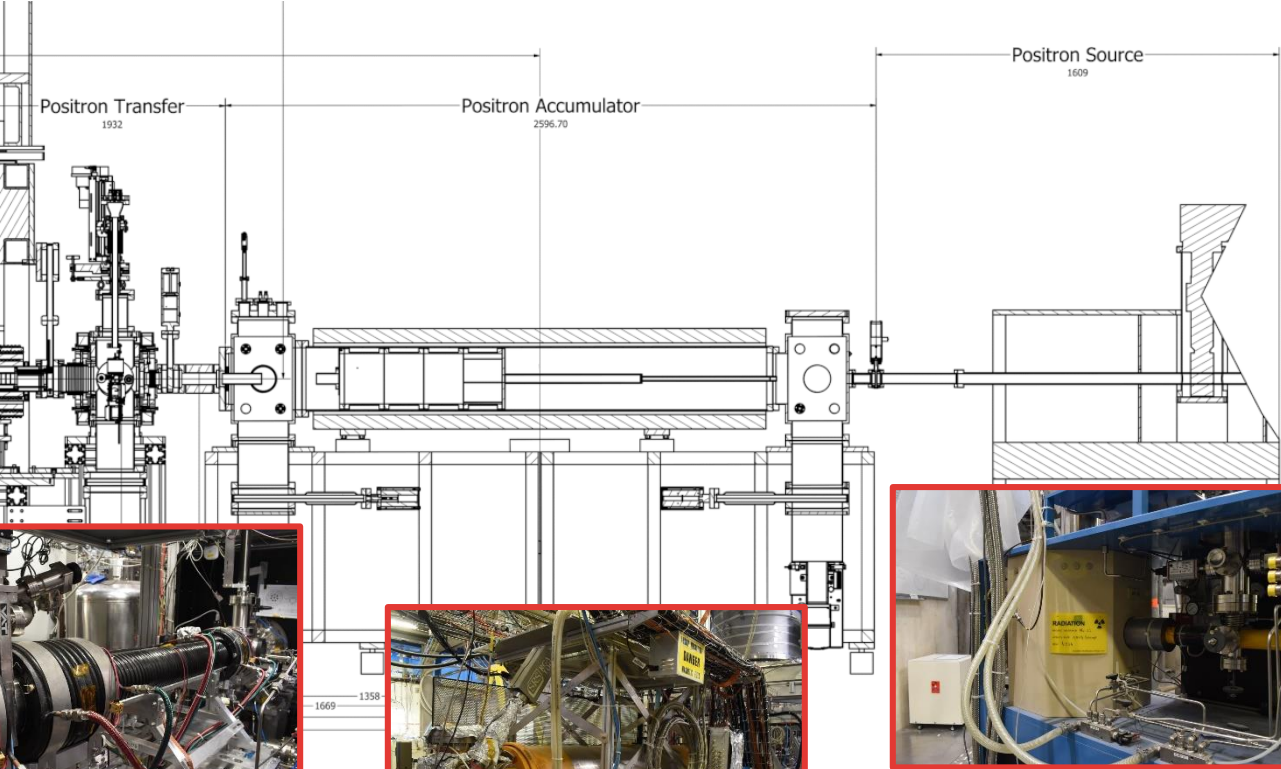
Studying symmetries between  
matter and antimatter  
Spectroscopy & gravity

ALPHA  $\alpha$

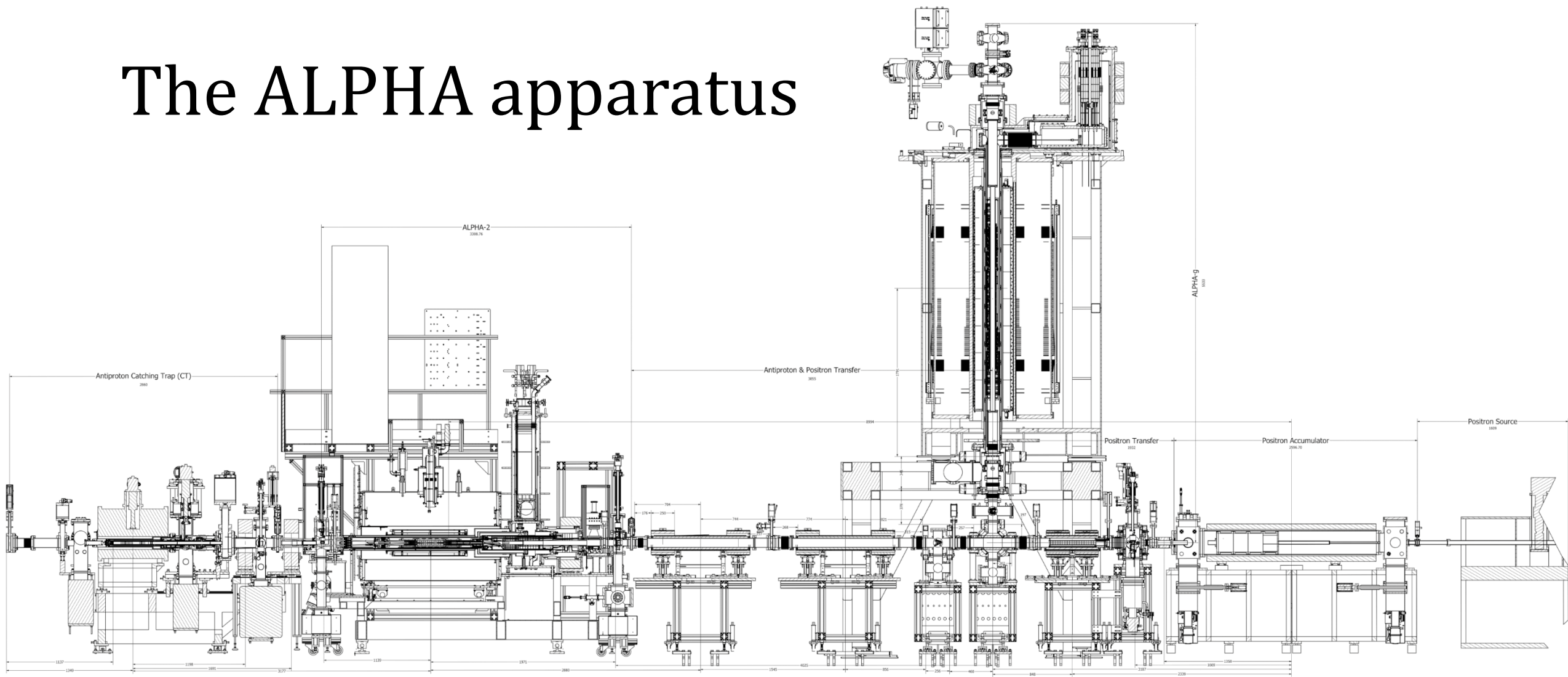
# The ALPHA apparatus



# Positron Transfer



# The ALPHA apparatus



# Where do the antiprotons come from?

$H^-$



LINAC 4

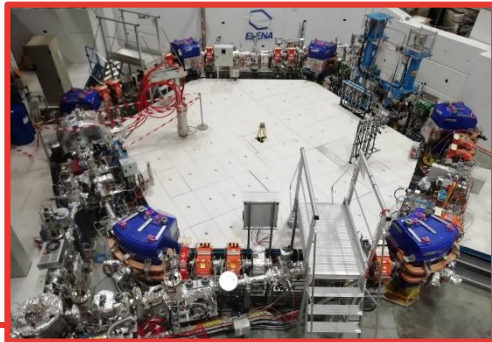
$H^-$   
 $p$



PS Booster

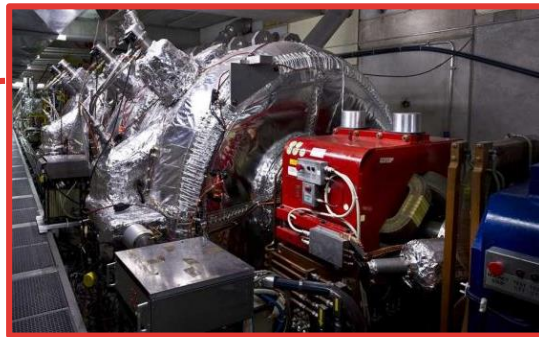
ALPHA  $\alpha$

$$\frac{v}{c} = 0,015$$

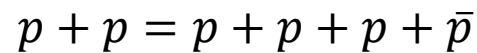


ELENA

$$\frac{v}{c} = 0,10$$



AD



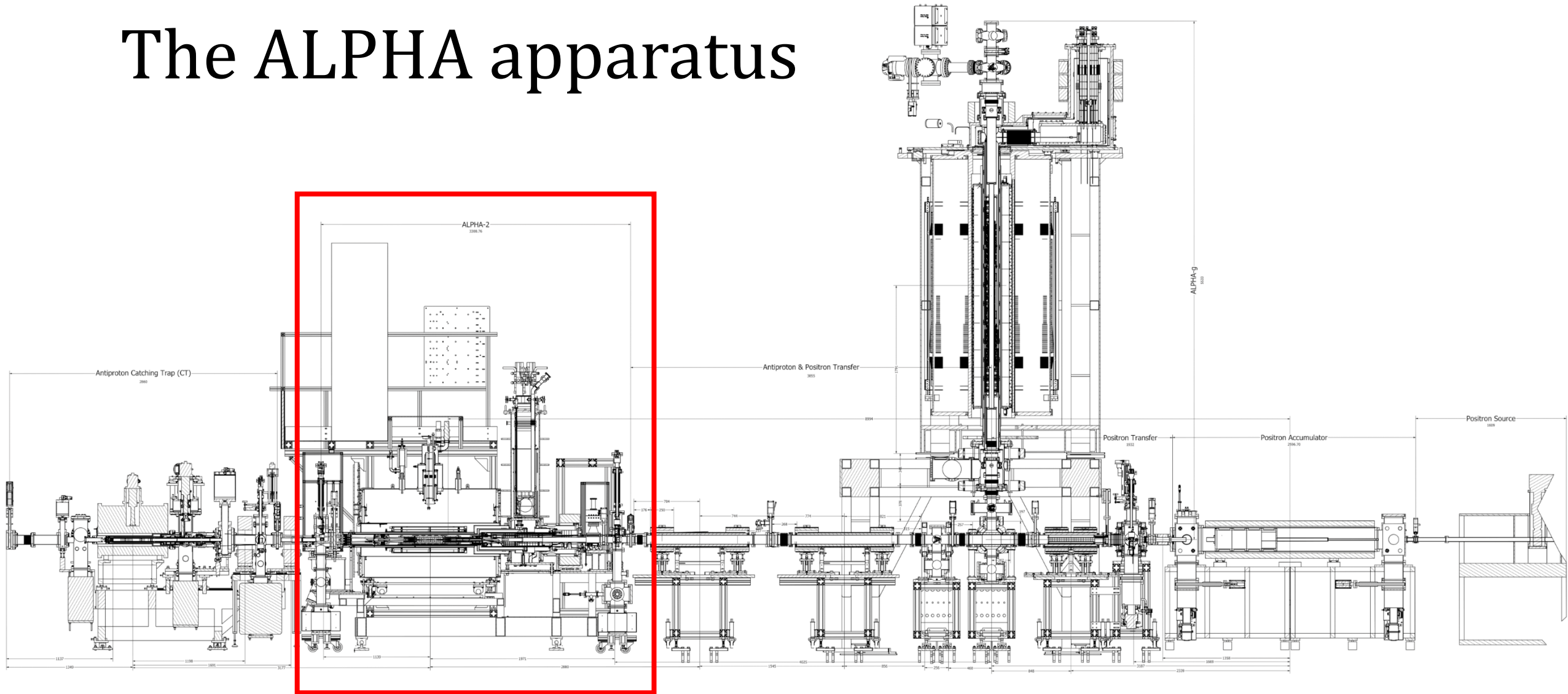
$\bar{p}$   
 $p$



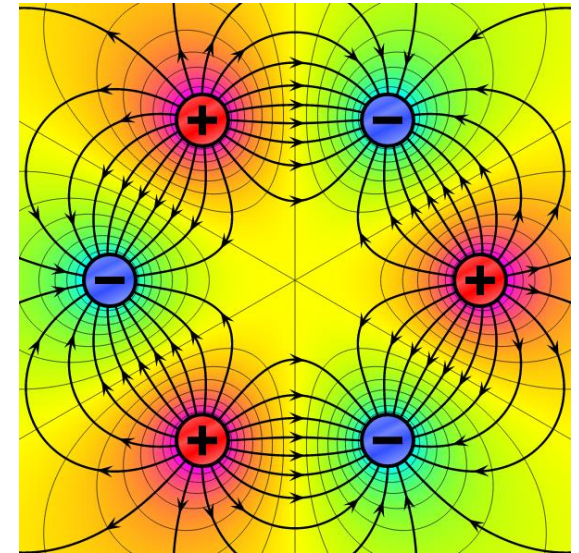
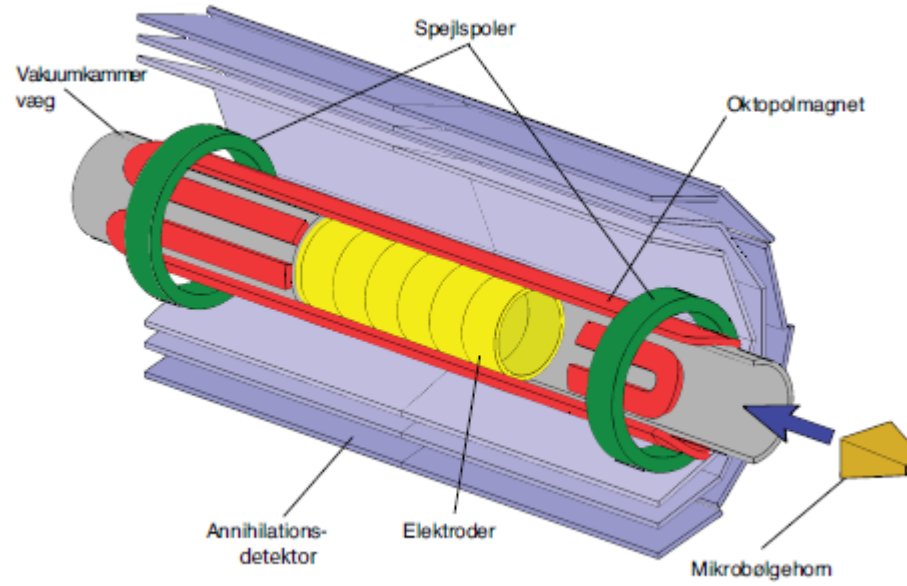
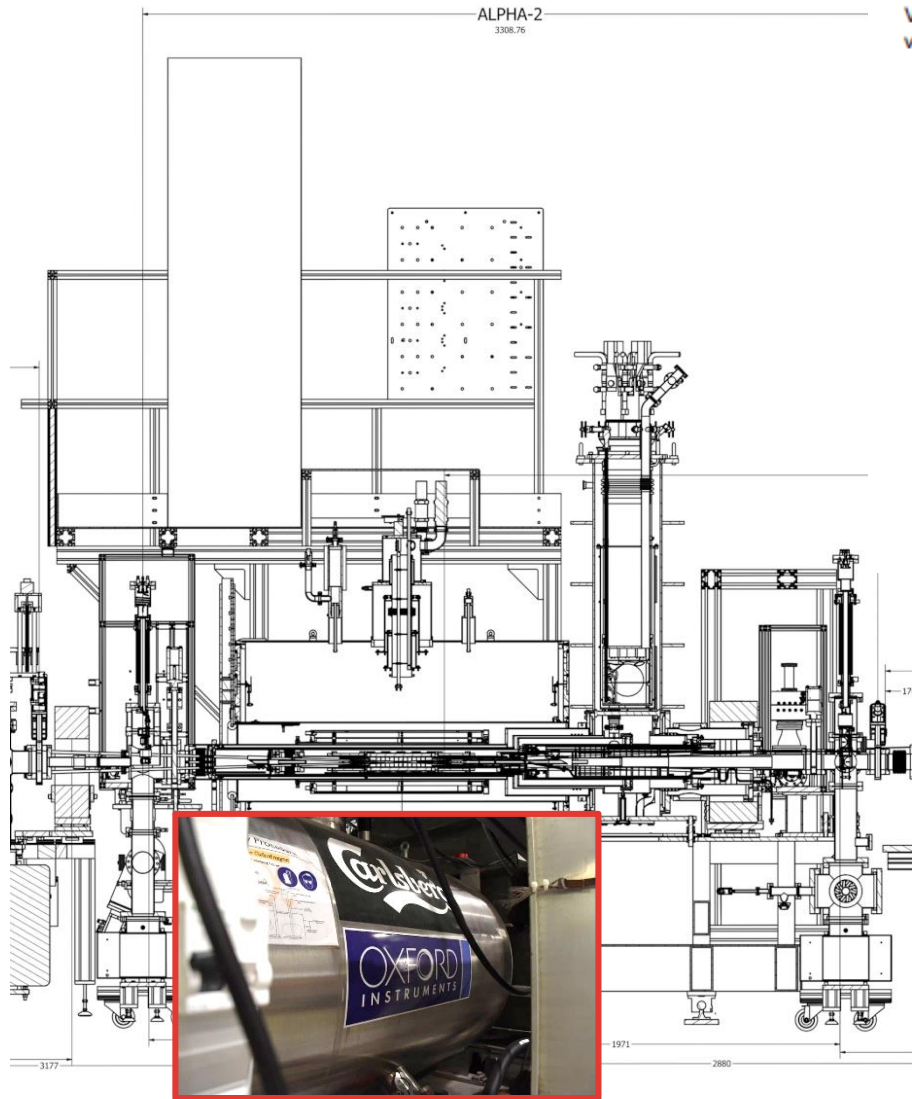
PS

ALPHA  $\alpha$

# The ALPHA apparatus



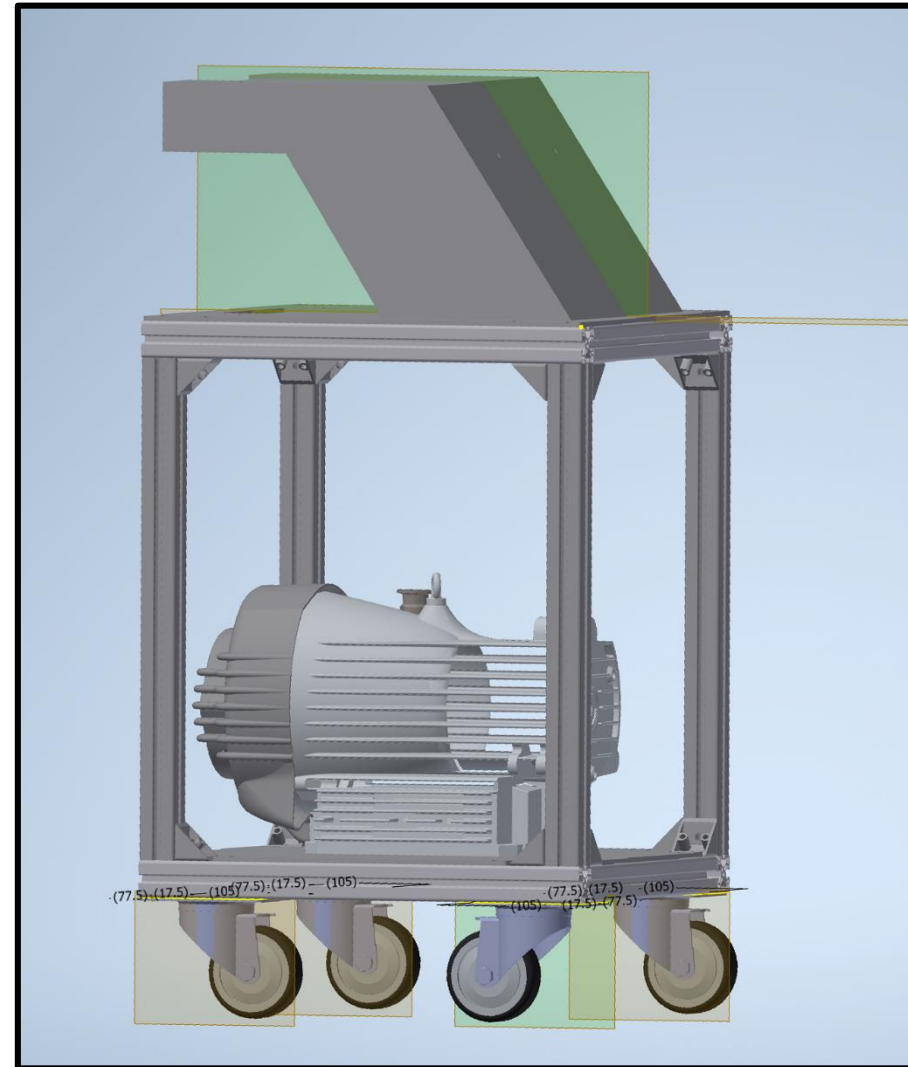
# $\bar{H}$ trapping





# Our contribution

- Unforeseen tasks (threads)
- Designing a pump table



# Future prospects

- Measuring the 1S-2S transition in antihydrogen with a precision of  $10^{-15}$
- Measuring gravitational acceleration for antimatter with a precision of  $\pm 10\%$

# Thank you's

- Our supervisor, Niels Madsen
- The whole ALPHA team
- Coordinators of HSSIP, Lars V. Jørgensen & Ian Bearden

