SIMULATING DETECTOR ENVIRONMENT

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AEGIS'S MAIN GOALS

Measurement of gravitational acceleration "**g**" for anti-hydrogen.

Other goals aside from main one:

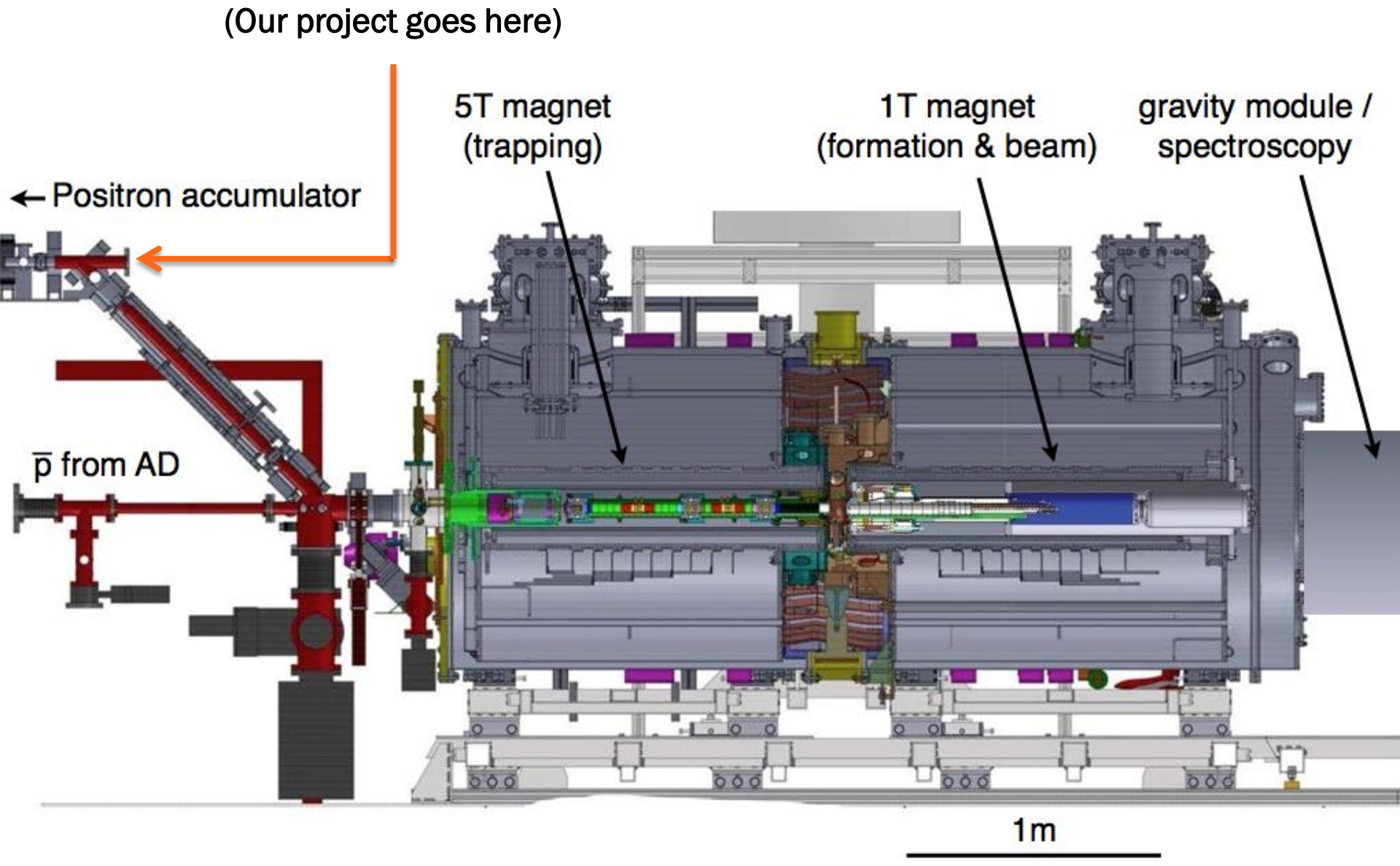
- Study of Rydberg atoms.
- Positronium formation, excitation, and spectroscopy.
- Spectroscopy of anti-hydrogen.

ANTIPROTON DECELERATOR

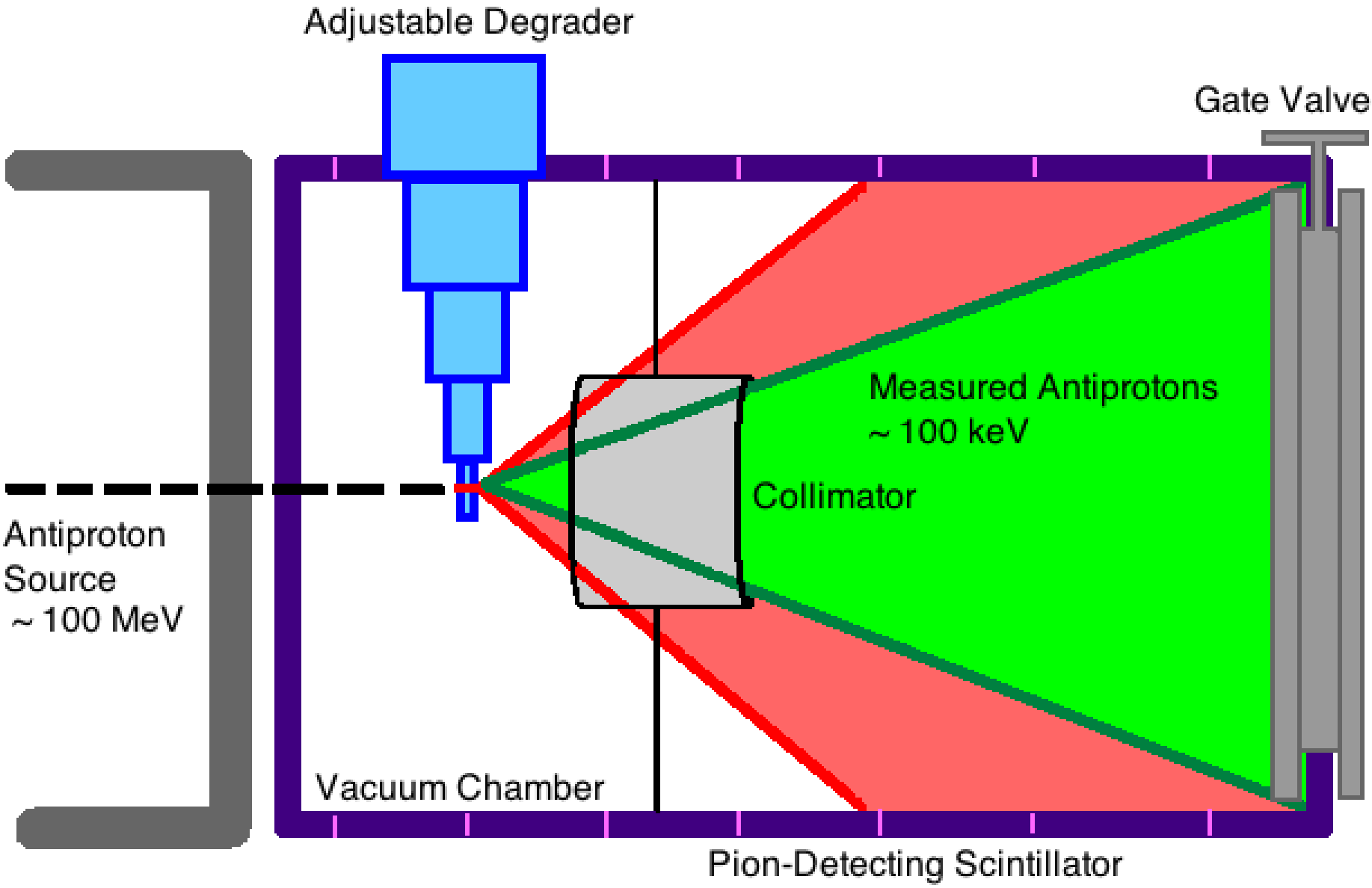
AD slows down antiprotons from near light speed to around 0.1c before sending them out for use.

The Antiproton Decelerator is an antiproton storage ring that supplies low energy antiprotons to various experiments at CERN (ATRAP, ASACUSA, ACE, ALPHA, and AEgIS).

WHAT ARE WE DOING?



OUR APPARATUS



GOALS

Using Geant4 to simulate the design of this side project. Various things need to be considered:

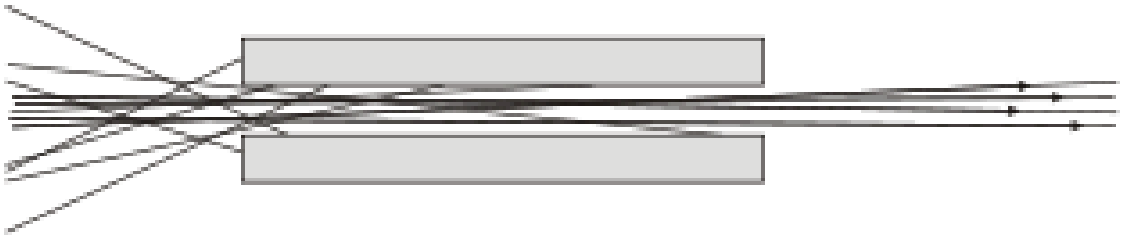
- How thick should the air gap between the beam and the detector entrance be?
- The degrader slows down (hopefully to ~100 kev) the antiprotons upon entering the experimental environment. What should be the gradient of thickness available for the degrader?

GOALS

We want the anti-protons to make it to the back of the barrel (~1 m).

- The main problem is that once antiprotons exit the degrader, they will be scattering at large angles, therefore annihilating with inner walls before they even reach the end of the barrel.

  → simulate a collimator, varying the radius to ensure that as many antiprotons as possible reach the back of the barrel, but do not annihilate on the walls (creating excess noise).



GOALS

So what is all of this for?

→ creating metastable (~10 μs) anti-protonic atoms.

→Part of the project is to scour the little literature available for different possible metastable antiprotonic atoms.

→Currently, only antiprotonic helium is stable enough to study.