Search for Trapped Antihydrogen in ALPHA\textsuperscript{1} NIELS MADSEN, Swansea University, ALPHA COLLABORATION — Antihydrogen (\( \bar{H} \)) spectroscopy promises the most precise tests of the symmetry of matter and antimatter and can possibly offer new insights into the baryon asymmetry of the universe. \( \bar{H} \) is however produced only in small quantities. The ALPHA collaboration therefore plans to trap \( \bar{H} \) to permit the use of precision atomic physics tools for comparisons of antihydrogen and hydrogen. Trapping of \( \bar{H} \) is challenging as neutral atom traps are shallow (\(~0.6\) K for ground state atoms) compared to typical recorded \( \bar{H} \) temperatures. The \( \bar{H} \) is formed at the temperature of the \( \bar{p} \) used for the synthesis. As no atom cooling is readily available the constituent \( \bar{p} \) and positrons (\( e^+ \)) must be cold for the creation of \( \bar{H} \). We show how ALPHA has addressed this challenge and we discuss the first systematic attempt at identifying trapped \( H \) in our system. This includes special techniques for fast release of the trapped anti-atoms, as well as a silicon vertex detector to identify \( \bar{p} \) annihilations. The silicon detector is crucial to efforts to reduce the background. We further discuss the background from mirror-trapped \( \bar{p} \), and how we can differentiate these from trapped \( \bar{H} \) atoms.

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