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Search for Trapped Antihydrogen in ALPHA[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 ($\sim$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 $\bar{H}$ 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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