Abstract Submitted
for the DAMOP08 Meeting of
The American Physical Society

Analytical Calculation of the Scattering Length in Antihydrogen-Atom Collisions GLEB GRIBAKIN, Queen's University Belfast, UK, SVANTE JONSELL, University of Wales, Swansea, UK, ALASTAIR THOMPSON, Queen's University Belfast, UK — We have extended the method of [1] to cold antihydrogen-atom collisions. The scattering length is determined by the mean scattering length $\bar{a} = 0.478(2mC_6)^{1/4}$, where m is the reduced mass and C_6 the van der Waals constant (in atomic units), and the semiclassical phase at zero energy. In addition, the antiproton-nucleus interaction is included through the strong-force scattering length $a_{\rm sf}$, whose imaginary part accounts for the antiproton annihilation. Our final result is

$$a = \bar{a}\left[1 - \frac{1 - a_0/\bar{a} - 2\pi a_{\rm sf}/a_c}{1 + (1 - a_0/\bar{a})(2\pi a_{\rm sf}/a_c)}\right],$$

where a_0 is the scattering length found neglecting the strong interaction, and $a_c = (mZ)^{-1}$ is the antiproton-atom Coulomb radius. Our value for for hydrogen agrees with [2]. Estimates are made for the noble gas atoms.

1. G. F. Gribakin and V. V. Flambaum, Phys. Rev. A **48**, 546 (1993).
2. S. Jonsell et al., J. Phys. B **37**, 1195 (2004); E. A. G. Armour, Y. Liu and A. Vigier, *ibid.* **38**, L47 (2005).

Gleb Gribakin
Queen's University Belfast, UK

Date submitted: 04 Feb 2008 Electronic form version 1.4