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**100-fold reduction of 2D spin-polarized hydrogen gas's clock-shifts explained** KADEN R.A. HAZZARD, ERICH J. MUELLER, Cornell University — Recent experiments have observed that when two-dimensional spin-polarized hydrogen is absorbed on a superfluid helium film, the density dependent shift of the 1S-2S spectral line (clock shift) is 100 times smaller than expected [1]. By studying the theory of interactions between hydrogen atoms and the helium surface, we show that helium-mediated hydrogen-hydrogen interactions dramatically reduce the clock shift. The mediated potential is sensitive to experimental parameters, such as temperature and $^3$He concentration. This explains another mysterious experimental result: we find that increasing $^3$He concentration increases the clock-shift, as observed. In contrast, the naive picture which neglects mediated interactions predicts the clock-shift to decrease with $^3$He concentration due to deconfinement of the hydrogen gas. [1] J. Ahokas, J. Järvinen, and S. Vasiliev, Phys. Rev. Lett. **98**, 43004 (2007).

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