Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Quantum Spin Holography with Surface State Electrons OLEG BROVKO, VALERI S. STEPANYUK, Max Planck Institute of Microstructure Physics, Halle, Germany — Recently Moon et al. have shown that information can be stored in a fermionic state of a two-dimensional electron gas and have dubbed the proposed concept quantum holographic encoding. They have constructed molecular holograms of CO molecules on a Cu(111) surface, hosting a surface state (SS) [2]. Interference of electron waves scattered at the molecules leads to formation of an electron density pattern representing an information page [1]. This page has then been read out with an STM. It has been also shown that using the innate energy dispersion of SS electrons one can project the hologram not only in two spatial degrees of freedom but also in the energy dimension. In our contribution we expand the concept and show that the spin of the electron can also act as a new dimension for information storage. If the molecules or atoms used for a hologram are magnetic then the scattering of surface state electrons becomes spin-dependent, allowing one to store different information pages in different spin channels. As an example we demonstrate the possibility of simultaneous encoding two different information pages with electrons of the same energy but opposite spins.

[1] C.R. Moon et al., Nature Nano. 4, 167 (2009)
[2] W. Shockley, Phys. Rev. 56, 317 (1939)

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Date submitted: 07 Nov 2011 Electronic form version 1.4