Abstract Submitted for the MAR05 Meeting of The American Physical Society

Topological effects on conduction electrons in ferromagnetic rings ADNAN REBEI, Seagate Technology, EUGEN SIMANEK, University of Califronia, Riverside — Using two examples, I will show possible measurable effects of global geometry on spin accumulations in ring geometries as a function of the diameter of the nano-ring. Because of the spin character of the conduction electrons and the magnetization in transition metals, we have two possible inequivalent spin structures on a ring which are given by the first Cohomology group of the ring. In the first example, the magnetization is assumed to be everywhere the same with respect to the normal to the ring, i.e., the magnetization has a 360 degrees periodicity. In the second example, the magnetization is assumed to have a 720 degrees periodicity and topologically equivalent to a Mobius band. In both examples the magnetization is locally the same but differ globally. We will argue that as the size of the ring becomes smaller (i.e., around 10 nm or less), the topologically non-trivial spin structure should become more stable. This topological property can manifest in e.g. resistance differential between the two examples. This latter physical effect is expected to be present in addition to the Berry phase.

> Adnan Rebei Seagate Technology

Date submitted: 30 Nov 2004

Electronic form version 1.4