



Weekly Seminar

Chiral solitons for topological informatics



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Storing and manipulating information in robust ways is of prime interest in wide areas of science and technology. Using topologically protected local excitations, such robust informatics may be realized. In magnetic information processing, the recent interest is focused on topological excitations of spins such as skyrmions. In electronic systems, Majorana Fermions of topological edge states are expected to realize topological quantum computation. This talk reviews our recent approach to this issue, dealing with new types of solitons in an electronic system, which are realized in an indium atomic wire array on Si(111) in its charge density wave ground state [1]. Due to the unique double Peierls chain structure, this system constitutes an unprecedented Z₄ topological insulator and its edge states are three distinct solitons with chiral dimension [2]. These chiral solitons can store quaternary bit information protected topologically. Moreover, the switching between solitons is observed, which corresponds to the algebraic operation embedded into the Z₄ topology [3]. This system may provide a novel device platform for topological multi-bit informatics.

[1] T.-H. Kim and H. W. Yeom, Phys. Rev. Lett. 109, 246802 (2012).

[2] S. M. Cheon, S.-H. Lee, T.-H. Kim and H. W. Yeom, Science 350, 6257 (2015).

[3] T.-H. Kim, S. M. Cheon, and H. W. Yeom, under review.



Prof. Han Woong Yeom was born in Seoul, and studied physics as an undergraduate at Seoul National University before going on to Tohoku University in Japan as a doctoral student. Thereafter he was a research associate at the Department of Chemistry, University of Tokyo (1996-2000). He then returned to his native South Korea, where he was an assistant/associate professor at the Department of Physics, Yonsei University (2000-2009), and then a full professor (2009-2010). Afterwards he moved to the Department of Physics, POSTECH (2010-present), where he served as Director of Center for Atomic Wires and Layers (2003-2012), Director of Center for Low Dimensional Electronic Symmetries (2012-2013), and Director of Center for Artificial Low Dimensional Electronic Systems, Institute for Basic Science (2013-present). Prof. Han Woong Yeom's major research interests lie in nano and atomic-scale structures on solid surfaces and low dimensional electronic properties of artificial materials. He has published over 160 SCI papers, including 30 in Phys. Rev. Lett. and 83 in Phys. Rev. B. Those papers were cited above 3900 times, and his H-index is 34.

