Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Thermoelectric effect by "perfectly conducting" edge current in the quantum spin Hall system RYUJI TAKAHASHI, Department of Physics, Tokyo Institute of Technology, SHUICHI MURAKAMI, Department of Physics, Tokyo Institute of Technology and PRESTO, JST — We report thermoelectric transport in the quantum spin Hall (QSH) system. Because a two-dimensional QSH system has helical gapless edge states, which are stable against nonmagnetic impurities, it is expected that nonmagnetic impurities can suppress thermal conductivity without lowering "perfectly conducting" edge conductivity. We therefore calculate thermoelectric properties of the two-dimensional QSH system in narrow ribbon geometry and discuss how to optimize the figure of merit. We argue that inelastic scattering length of the edge states controls the thermoelectric properties. We show that the edge transport becomes dominant by lowering temperature, because of an increase of the inelastic scattering length. We also found that the contribution from edge and from the bulk compete each other. Correspondingly, by lowering temperature, the figure of merit will first decrease and then will increase again due to edge-state-dominant thermoelectric transport.

[1] R. Takahashi, S. Murakami, arXiv:0910.4827.

Ryuji Takahashi
Department of Physics, Tokyo Institute of Technology

Date submitted: 25 Nov 2009 Electronic form version 1.4