Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Thickness dependent thermoelectric properties of $SrTiO_3/SrLaTiO_3$ and $SrZrO_3/SrLaTiO_3$ heterostructures MASATOSHI ISHII, JOHN BANIECKI, Fujitsu Laboratories Ltd., ROBERT SCHAFRANEK, KIAN KERMAN, Harvard University, KAZUAKI KURIHARA, Fujitsu Laboratories Ltd. — Thermoelectric power generators will be required for future sensor network systems. $SrTiO_3$ (STO) [1] is one candidate thermoelectric material due to its non-toxicity and comparable power factor to Bismuth telluride. The energy conversion efficiency of $SrTiO_3$–based thermoelectric energy conversion elements has been reported to be enhanced by quantum size effects, such as the two dimensional (2D) electron gas in $SrTiO_3/SrTi_{0.8}Nb_{0.2}O_3/SrTiO_3$ [2]. Nevertheless, a complete understanding of the mechanisms for the reported increase in efficiency are missing owing to a lack of understanding of the thickness dependence of the transport properties. In the talk, we will present a study of the thickness dependence of the transport properties of $SrTiO_3/SrLaTiO_3$ and $SrZrO_3/SrLaTiO_3$ heterostructures. The $SrZrO_3/SrLaTiO_3$ interface has a large conduction band off-set of 1.9 eV [3] which can be utilized to confine electrons in a 2D quantum well. Characterization of the thermopower, conductivity, and Hall effect will be presented as a function of the $SrLaTiO_3$ thickness down to a few unit cells and the implications of the thickness dependence of the transport properties on carrier confinement and increasing the efficiency STO-based 2DEG quantum well structures will be discussed. [1] J. Baniecki et al, Appl. Phys. Lett. 99, 232111 (2011); [2] H. Otha et al., Nature materials, 6, 129 (2007); [3] R Schafranek et al, J. Phys. D: 45 055303 (2012)

Masatoshi Ishii
Fujitsu Laboratories Ltd.

Date submitted: 15 Nov 2012 Electronic form version 1.4