Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Ultrasonic dispersion due to the rattling motion in the filled skutterudite La($Os_{0.5}Ru_{0.5}$)$_4Sb_{12}$ TATSUYA YANAGISAWA[1], W.M. YUHASZ, M.B. MAPLE, IPAPS / UCSD, Y. NEMOTO, T. GOTO, Grad School of Science and Technology / Niigata Univ. — The filled skutteruditesRM_4Sb_{12} (R: rare-earth, M: transition metal) show a considerable reduction of thermal conductivity, which is caused by the rattling motion of the weakly bonded rare-earth ion in an oversized icosahedral cage of antimony. Ultrasound measurements are useful for observing the rattling motion of the rare-earth ion. Our recent ultrasonic study* demonstrated the ultrasonic dispersion in the elastic constant $(C_{11} - C_{12})/2$ due to the rattling motion of Pr in $PrOs_4Sb_{12}$, which is the first Pr-based heavy fermion superconductor with T_C= 1.85 K. In order to examine the rattling motion in a system without 4f-electrons, we have performed ultrasonic measurements on La($Os_{0.5}Ru_{0.5}$)$_4Sb_{12}$. The longitudinal C_{11} mode shows Debye-type dispersion and, at around 50 K, the ultrasonic echo shows the highest attenuation. The rattling motion of La has thermally activated behavior according to the relaxation data. In contrast, the transverse C_{44}mode shows only a monotonic increase. These results suggest that, like $PrOs_4Sb_{12}$, the rattling motion in La($Os_{0.5}Ru_{0.5}$)$_4Sb_{12}$has Γ_3 symmetry. T. Yanagisawa is supported by a Research Fellowship of the JSPS Young Scientists. The research at UCSD was supported by U.S. DOE., [*Phys. Rev. **B 69**, 180511 (R) 2004]

[1]also at Grad School of Science and Technology / Niigata Univ.

Tatsuya Yanagisawa
IPAPS / UCSD

Date submitted: 08 Dec 2004 Electronic form version 1.4