Abstract Submitted
for the 4CF06 Meeting of
The American Physical Society

Ultrasonic studies of Ti-Zr-Ni Quasicrystals TRUMAN WILSON, DENNIS AGOSTA, ROBERT LEISURE, Department of Physics, Colorado State University — Quasicrystalline materials lack the translational periodicity of ordinary crystals, yet are highly ordered. In particular, they have rotational symmetries forbidden for crystals made of repeating unit cells. Much is unknown about the structure and interatomic interactions of these materials. Elastic constants are sensitive to both the local structure and the interatomic potentials. Resonant ultrasound spectroscopy was used to study $Ti_{39.5}Zr_{39.5}Ni_{21}$ quasicrystals. In this technique the vibrational eigenmodes of small parallelepipeds are excited and analyzed to determine elastic constants and ultrasonic loss. The experiments were carried out over the temperature range of 3 – 500 K. The bulk, shear, and Young's moduli, as well as Poisson's ratio were determined. The ultrasonic loss was also studied. The temperature dependence of the elastic constants resembles that of ordinary metals, approaching 0 K with zero slope, and becoming linearly dependent on temperature at higher temperatures. The ultrasonic loss shows a broad peak centered near room temperature, which may be associated with phason flips.

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Date submitted: 07 Sep 2006 Electronic form version 1.4