

Abstract Submitted  
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**Study of Phonons in  $\delta$ -Plutonium near the  $\delta-\alpha'$  Structural Phase Transition by X-ray Thermal Diffuse Scattering** RUQING XU, Univ. of Illinois at Urbana-Champaign, JOE WONG, Lawrence Livermore National Lab, PAUL ZSCHACK, Argonne National Lab, HAWOONG HONG, TAI-CHANG CHIANG, Univ. of Illinois at Urbana-Champaign — The 5f electrons in Pu can be either bonding or localized, depending sensitively on the temperature, pressure, and impurity doping. As a result, Pu displays a rich phase diagram involving a large number of phases with substantially different atomic volumes. In a recent report of the phonon dispersion curves of Ga-stabilized  $\delta$ -Pu at room temperature and ambient pressure, a pronounced deepening of the TA[111] phonon branch near the L point was discovered. This phonon softening was suggested to be related to a lattice shearing mechanism that could lead to the structural phase transition from the fcc  $\delta$  phase to the monoclinic  $\alpha'$  phase at about 170 K. Here we report our measurements of x-ray thermal diffuse scattering from a  $\delta$ -Pu crystal (with 0.6 wt% Ga) at temperatures from 307K to 200K. The results show no further softening of the phonons near the L point as the sample temperature decreases. The implications regarding the relationship between the soft mode and the phase transition will be discussed.

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