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Debye-Waller factor in solid He-4 at sub-Kelvin temperatures ELIZABETH BLACKBURN, JOHN M. GOODKIND, SUNIL K. SINHA, University of California, San Diego, JACOB HUDIS, COLLIN BROHOLM, Johns Hopkins University, JOOST VAN DUIJN, Universidad Complutense de Madrid, Spain, RICHARD DOWN, OLEG KIRICHEK, CHRIS D. FROST, ISIS Facility, Rutherford Appleton Laboratory, UK — The recent observation by Kim and Chan [Science 305 (2204) 1941] of a transition at low temperatures ($\sim 200~\rm mK)$) in the hcp-phase of solid helium has re-opened interest in the old question of supersolidity. The nature of the low-temperature phase remains in question, and to investigate this in more detail, we have measured the density distribution of He-4 nuclei in crystals of He-4 with a molar volume of 21.3 cm³ down to 140 mK. We find no evidence for any changes in the vicinity of the transition. Treating the material as a traditional crystal, we have extracted the mean square displacement for the nuclei and find anisotropy between the in- and out-of-plane motions. Our values are in agreement with previous work at higher temperatures.

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