Erratum: Using Diffuse Scattering to Observe X-Ray-Driven Nonthermal Melting [Phys. Rev. Lett. 126, 015703 (2021)]

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Since performing the analysis presented in this Letter, we have become aware that the values quoted for the incident x-ray pulse intensities and fluences, and hence the absorbed doses in the sample, are incorrect. These values were calculated using the fluence present in the beam as it exits the undulator, and did not account for losses in the subsequent propagation and focusing. Because of filtering and the use of Kirkpatrick-Baez mirrors to achieve a nanometer-scale focus [1,2], the transmission is just over 25%, significantly reducing the energy incident onto the target. While this erratum does not affect the scientific results obtained, the corrected values should be noted and used in any comparison between the results from this beamtime, published here and in [3], and future work.

Accounting for the weaker x-ray beams, we find an actual pump beam intensity of $1.6 \pm 0.5 \times 10^{19}$ W/cm^2 (fluence of $1.1 \pm 0.4 \times 10^5$ J/cm^2). After absorption in the silicon sample, this would correspond to a deposited dose of 1.02 keV/atom, if we assume that all deposited energy remains within the focal spot, or 8.3 eV/atom if the energy is spread uniformly across the range of excited photoelectrons. As we said in our Letter, the actual values would fall between these extremes, but in both cases are well above the estimated damage thresholds for nonthermal melting, which range from 0.9–2.1 eV/atom [4–6]. Our conclusion, that this rapid disordering is driven by induced Coulomb forces rather than electron-ion equilibration, is therefore unaffected.

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