Finite temperature dense matter studies on next-generation light sources

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The construction of short-pulse tunable soft x-ray free electron laser sources based on the self-amplified spontaneous emission process will provide a major advance in capability for dense plasma-related and warm dense matter (WDM) research. The sources will provide 10^{13} photons in a 200-fs duration pulse that is tunable from approximately 6 to 100 nm. Here we discuss only two of the many applications made possible for WDM that has been severely hampered by the fact that laser-based methods have been unavailable because visible light will not propagate at electron densities of $n_e \geq 10^{22}\,\mathrm{cm}^{-3}$. The next-generation light sources will remove these restrictions.

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