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EXAFS study of solid iron up to 560 GPa[1] F. COPPARI, Y. PING, D. HICKS, LLNL, B. YAAKOBI, U. Rochester, D. FRATANDUONO, S. HAMEL, J. EGGERT, R. RYGG, R. SMITH, D. SWIFT, LLNL, T. BOEHLY, U. Rochester, G. COLLINS, LLNL — Dynamic compression with ramp-shaped laser pulses is a technique for creating off-Hugoniont solid states at pressures well above the limit of static compression. Using a series of weak shocks to approximate a ramp drive, iron is compressed up to 560 GPa, the highest pressure ever reached in solid iron. EXAFS (extended x-ray absorption fine structure) study of the quasi-ramp-compressed iron is performed with an implosion backlighter on OMEGA laser. EXAFS data provide simultaneous measurements of density, temperature and the short-range atomic structure, showing the first clear evidence in the pressure-temperature map for off-Hugoniont states by quasi-ramp-compression. It is found that the close-packed structure of Fe is stable up to 560 GPa. The final temperature results from heating due to work against the strength of iron in addition to heating by the first shock.

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