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Measuring the Melting Curve of Iron at Super Earth Core Conditions RG KRAUS, LLNL, RJ HEMLEY, George Washington University, R COHEN, Carnegie Institution, MG NEWMAN, Caltech, JR RYGG, LLE, ST STEWART, UC Davis, L STIXRUDE, UCL, JL BELOF, LX BENEDICT, F COPPARI, DE FRATANDUONO, S HAMEL, A LAZICKI, J MCNANEY, M MILLOT, C WEHRENBERG, JH EGGERT, LLNL — The melting transition is critical to the Earth's evolution and habitability, as the latent heat from solidification of the inner core helps drive the magneto-dynamo in the liquid outer-core, which creates a magnetosphere that protects Earth's surface from harmful charged particles emitted from the Sun. As thousands of extrasolar planets are being discovered, an important question is whether a super Earth could have a solidifying iron inner core at pressures of 5-30 Mbar. At the National Ignition Facility (NIF), we have begun a campaign to experimentally address this question, where we shock the iron samples into the liquid state and then subsequently shocklessly compress the iron along a high temperature adiabat until the sample reaches a well defined peak pressure. At this point, we probe the iron sample with x-ray diffraction and test for solidification. We will present initial results on the melting curve of iron up to 5.5 Mbar and also the phase of iron below the melting curve. These results provide us with the stable phase of iron at the pressure and temperature conditions that are found within the Earth's inner core and the cores of Super Earths. This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

Richard Kraus
Lawrence Livermore National Laboratory

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