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Phase diagram of URu$_{2-x}$Fe$_x$Si$_2$ under high magnetic field.$^1$ S.
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State University, J. SINGLETON, Los Alamos National Laboratory, University of
Oxford — The search for the order parameter of the hidden order (HO) phase in
URu$_2$Si$_2$ has attracted an enormous amount of attention for the past three decades.
Measurements on URu$_2$Si$_2$ in high magnetic fields up to 45 T reveal that URu$_2$Si$_2$
displays behavior that is consistent with quantum criticality at a field near 35 T,
where a cascade of novel quantum phases was found at and around the quantum
critical point, suggesting the existence of competing order parameters. Experiments
at high pressure reveal that a first order transition from the HO phase to a large
moment antiferromagnetic (LMAFM) phase occurs under pressure at a critical pres-
sure $P_c$. We have recently demonstrated that tuning URu$_2$Si$_2$ by substitution of Fe
for Ru offers an opportunity to study the HO and LMAFM phases at atmospheric
pressure. In this study, we performed transport measurements in high magnetic field
on URu$_{2-x}$Fe$_x$Si$_2$ single crystals for various values of x and established the phase
diagrams of URu$_{2-x}$Fe$_x$Si$_2$ under high magnetic field.

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