Single Crystal Study of Fe and Os doped URu$_2$Si$_2$


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URu$_2$Si$_2$ is a heavy fermion compound that has been studied for the past two decades in an effort to understand the state below 17.5K that has been termed hidden order [1]. Hydrostatic pressure above $P_c = 0.5$GPa causes this hidden order state to transition into antiferromagnetism [2]. Understanding the transition between these two states may help unravel the mystery of hidden order, however the technical challenges of experiments under pressure have limited the experimental techniques applicable to study this transition. Results on polycrystalline samples of isoelectronic Os and Fe doped URu$_2$Si$_2$ have shown doping-temperature phase diagrams that resemble the P-T phase diagram of URu$_2$Si$_2$ [3], however these works on polycrystalline samples did not use local probes of magnetism to allow identification of the magnetic state of the samples. In this poster we present elastic neutron scattering and muon spin relaxation results on single crystals which demonstrate that both Fe and Os doping cause a transition from hidden order to antiferromagnetism at low doping levels.

