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Magnetic penetration depth and skin depth study of superconductivity and quantum criticality in $Ce_{1-x}R_xCoIn_5$ (R=La and Nd) HYUNSOO KIM, M. A. TANATAR, K. CHO, J. MURPHY, R. PROZOROV, The Ames Laboratory, Ames, IA, R. HU, C. PETROVIC, Brookhaven National Laboratory, Upton, NY — A heavy fermion superconductor $CeCoIn_5$ shows different responses to Nd- or La- substitutions for Ce, with the former inducing static magnetic order coexisting with superconductivity for some concentrations. To understand the origin of the differences, we studied the temperature and field dependent in-plane magnetic penetration depth, $\lambda(T)$, in single crystals of (Ce,R)$CoIn_5$ (R=La, Nd). Measurements were performed with a tunnel diode resonator down to 50 mK in a dilution refrigerator, in magnetic field up to 14 T parallel to the c-axis. These low-temperature and high field measurements allowed for the exploration for the full domain of superconductivity and quantum criticality in the $T-H$ phase diagram. Some previously unreported features were observed and will be discussed from the point of view of measured differential magnetic susceptibility. Combined with the contact-less measurements of resistivity via normal-state skin depth, these measurements bring new insight into the interplay between superconductivity and magnetism as well as field-tuned quantum critical behavior of doped 115 systems.

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