Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Maximizing superconducting coupling strength in heavy-fermion hybrid superlattices of $CeCoIn_5/CeRhIn_5$ MASAHIRO NARITSUKA, TOMOHIRO ISHII, SOUHEI MIYAKE, YUICHI KASAHARA, TAKAHITO TERASHIMA, YUJI MATSUDA, Kyoto University, YOSHIFUMI TOKIWA, Augsburg University, MASAAKI SHIMOZAWA, TAKASADA SHIBAUCHI, The University of Tokyo, P. F. S. ROSA, YONGKANG LUO, FILIP RONNING, JOE D. THOMPSON, Los Alamos National Laboratory — Interplay between superconductivity and magnetism continues to provide central topics in condensed matter physics. Among others, $CeTIn_5$ (T = Co, Rh) compounds offer one of the suitable platforms for the study of this important issue. An intriguing issue concerns coexistence of superconductivity and antiferromagnetism which could be realized at an artificial interface of different materials, but it is not clear how the two different states are affected each other at the interface. Here, by molecular beam epitaxy, we fabricate hybrid superlattices consisting of alternating layers of superconducting $CeCoIn_5$ and antiferromagnetic $CeRhIn_5$. In the hybrid superlattices, we found the presence of both superconducting and antiferromagnetic phases. At ambient pressure, the superconductivity is strongly Pauli limited. On the other hand, with approaching to the quantum critical point of $CeRhIn_5$ layers under applied pressure, the superconductivity is no longer Pauli limited. These results provide the evidence of maximizing superconducting coupling strength in a superlattice structure built of superconducting layer and quantum critical layer.

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Date submitted: 11 Nov 2016 Electronic form version 1.4