Enhanced Thermal Transport along the Nodal Direction of d-wave Superconductor CeCoIn$_5$\textsuperscript{1} ROMAN MOVSHOVICH, DUK Y. KIM, SHIZENG LIN, FRANZISKA WEICKERT, ERIC D. BAUER, FILIP RONNING, J. D. THOMPSON, Los Alamos National Laboratory — Four-fold oscillation in thermal conductivity with respect to the direction of the magnetic field is a strong evidence of a $d$-wave superconductivity. Previously, a smooth oscillation was found when the thermal conductivity of unconventional superconductor CeCoIn$_5$ was measured along $[100]$, the anti-nodal direction for its $d_{x^2-y^2}$-wave order parameter, with magnetic field rotating in the $ab$-plane. We present measurements of the thermal conductivity in CeCoIn$_5$ with the heat current along the $[110]$, nodal, direction. A sharp resonance-like peak in thermal conductivity was observed when the magnetic field is also in the $[110]$ direction, parallel to the heat current. We can qualitatively understand this zero-angle resonance within the present theory for the heat transport in $d$-wave superconductors. The theory, however, fails to quantitatively reproduce the details of the field-evolution of the data. The contribution of the vortex core states and Pauli limiting effect should be considered to develop a realistic theory for the thermal transport in unconventional superconductors.

\textsuperscript{1}Work at Los Alamos was performed under the auspices of the U.S. Department of Energy, Office of Basic Energy Sciences, Division of Materials Sciences and Engineering.

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