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Magnon contributions to thermal conductivity and thermopower in a metallic thin film[1] DEVIN WESENBERG, Univ of Denver, ERIC EDWARDS, JUSTIN SHAW, National Institute of Standards and Technology, BARRY ZINK, Univ of Denver — Recent theoretical and experimental work has renewed interest in the role of magnons in the transport and thermoelectric properties of metallic ferromagnets. Magnon Drag is one consequence of the electron-magnon interaction whereby the spin excitations in a magnetic material transfer momentum to the electron system and increase the thermopower. Recent theoretical approaches clarify that magnon drag understandably depends on the Gilbert damping, α, present in a given material. [1] The simplest theory predicts a magnon drag thermopower S_{md} that is maximized by reduction of α. Here we show that a low-damping metal, such as the $Co_{25}Fe_{75}$ alloy thin film [2] that has intrinsic Gilbert damping approaching the 10^{-4} level typically seen only in ferromagnetic insulators, has thermal conductivity that deviates strongly from typical metal films, with a significant peak in thermal conductivity at 225K. This material also has a large deviation from the expected Seebeck coefficient estimated from the alloy's composition and density of states. These results suggest a large contribution from a magnon or spin effect due to the intrinsic low damping of magnetization dynamics in the metal. [1] S. J. Watzman, et al. "Magnon-drag thermopower and Nernst coefficient in Fe, Co, and Ni." PRB 94, 144407 (2016). [2] M. A. W. Schoen, et al. "Ultra-low magnetic damping of a metallic ferromagnet." Nature Physics 12, 839 (2016).

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Devin Wesenberg
Univ of Denver

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