

Abstract Submitted  
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**Temperature and temporal evolution of nonlocal spin signals<sup>1</sup>**

YI JI, HAN ZOU, University of Delaware — An unusual temperature evolution of spin signals has been previously reported by others for metallic nonlocal spin valves (NLSV): The spin signal increases as the temperature decreases from room temperature, reaches a maximum value around 50 K, and then decreases as the temperature approaches 4 K. This has been interpreted as due to a high surface spin-flip rate, but the origins of which are yet to be understood. In this work, we show that for an as fabricated Py-Cu NLSV device this temperature dependence is clearly observed. The device was then stored in the ambient environment for a period of 5 months. Afterwards, we found an increase of the spin signals, and more interestingly the spin signal levels off at 27 miliohms, instead of decreasing, below 50 K. Based on this and our other experiments, we conclude that the surface spin-flip scattering originates from the magnetic impurities embedded in the Cu channel near the side surfaces. Upon oxidizing the Cu, the surface impurities are buried in the copper oxide and become less accessible to the conduction electrons. Therefore the surface spin-flip rate is reduced over time.

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