

Abstract for an Invited Paper  
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**Quantum spin hall effect in LaAlO<sub>3</sub>/SrTiO<sub>3</sub> nanostructures<sup>1</sup>**

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LaAlO<sub>3</sub>/SrTiO<sub>3</sub> heterostructures are known to exhibit strong spin-orbit coupling. We investigate local and non-local transport behavior of nanoscale Hall crosses created by conductive AFM lithography. The four-terminal resistance of these structures is consistently found to be  $\sim h/e^2$ , independent of the length of the channel. We also observe large (1-10 k $\Omega$ ) non-local resistances and zero-field Hall resistance that are attributed to quantum spin Hall phase with a spin-orbit derived pseudo-magnetic fields  $B_{eff} \sim 15$  T. The pure spin current is blocked by Cooper pairs that form below T<sub>c</sub> 200 mK, leading to a collapse of the non-local and zero-field Hall resistances.

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