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High Field Magnetoresistance Measurements on the Surface States of Samarium Hexaboride using Corbino Structures[1] STEVEN WOLGAST, YUN SUK EO, GANG LI, ZIJI XIANG, COLIN TINSMAN, TOMOYA ASABA, BENJAMIN LAWSON, FAN YU, J.W. ALLEN, KAI SUN, LU LI, CAGLIYAN KURDAK, Dept. of Physics, University of Michigan, DAE-JEONG KIM, ZACHARY FISK, Dept. of Physics and Astronomy, University of California, Irvine — The recent conjecture of a topologically-protected surface state in SmB_6 and the verification of robust surface conduction below 4 K have led to a large effort to understand the surface states. Extracting carrier density and charge mobility of these states via Hall measurements is complicated because current can flow on all surfaces of a topological insulator, each of which can have different transport characteristics. We study magnetotransport of SmB_6 surfaces up to 45 T using a Corbino geometry that is sensitive to individual surfaces. The Corbino allows us to measure conductivity, σ_{xx}, in both parallel and perpendicular magnetic fields. In the parallel geometry both (110) and (100) samples show a strong negative magnetoresistance. We extracted information about the carrier mobility from the ratio of the perpendicular and parallel magnetoresistance traces. The (110) surface had the highest carrier mobility of 122 cm^2/Vs with a carrier density of 2.5×10^{13} cm^{-2}. The conduction on both polar (100) and non-polar (110) surfaces strongly indicates that the conduction must have a non-polarity-driven origin.

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