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Photon-Spin Drag on a Plasmonic Metasurface XINGJIE NI, JUN XIAO, SUI YANG, YUAN WANG, University of California, Berkeley, XIANG ZHANG, University of California, Berkeley; Materials Sciences Division, Lawrence Berkeley National Laboratory — Classical polarized light carries spin and reveals spin-orbit coupling when propagating along a curved trajectory, however this interaction typically is very weak. Utilizing a metasurface can greatly enhance this interaction because it can bend light abruptly within an extremely small thickness due to the large induced momentum. This strong photonic spin-orbit coupling on a metasurface could drive the electrons collectively and lead to direct electric currents flowing transversely to the light-bending direction, even at normal incidence and without external magnetic fields. Such a photon-spin drag effect has never until now been demonstrated. Here we report the first direct observation of this effect on a metallic metasurface consisting of complementary nanoantennas. By inputting opposite photonic spins, we directly detect the changes inversion of the transverse current direction. This effect enables an electrical detection of photon spin-orbit interactions and provides a viable route to directly integrate modern electronic chips with the additional spin degree of freedom of light for future information processing and communication applications.

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