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Electric field tuning of anisotropic magneto-transport properties of two-dimensional electron gas at the surface of SrTiO3 LUDI MIAO, RENZHONG DU, YUEWEI YIN, QI LI, Department of Physics, The Pennsylvania State University — Two-dimensional electron gases (2DEGs) at transition metal oxide surfaces and interfaces have attracted much attention due to their fascinating exotic properties such as superconductivity, large magneto-resistance and ferromagnetism. We have created a 2DEG at the (001) surface of SrTiO3 by Ar+-irradiation and measured its anisotropic magneto-resistance (AMR). The 2DEG exhibits a fully metallic behavior with a low temperature mobility as large as 5500 cm2V-1s-1. At low temperatures, a mixture of a four-fold component which reflects the four-fold symmetry of the SrTiO3 Fermi surface and only appears in a two-dimensional system as well as a two-fold component which is due to the Lorentz force effect are observed in the AMR. These components can be separated by Fourier analysis. Moreover, the four-fold component can be modulated by electric field applied by a back gate. The electric field induced redistribution of oxygen deficiencies which are created at the SrTiO3 surface during Ar+-irradiation and hence the tuning of dimensionality of the system are responsible for the modulation on AMR.

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