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The two-dimensional electron liquid (2DEL) formed at the $LaAlO_3/SrTiO_3$ (LAO/STO) interface is related to the electrons located in 3*d*-orbit of Ti. Due to electron-electron interactions, the ground state of the system, which is either superconducting or magnetic, is sensitive to external electric field that changes the carrier density by tuning the shape and width of the potential well [1]. On the other hand, a charge-transfer-induced modulation doping can be made by inserting a $LaMnO_3$(LMO) buffer layer into LAO/STO interface which not only significantly suppresses the carrier density but also boosts the mobility of these carriers[2]. Herein, we report unforeseen tunability of the phase diagram of the metallic LAO/STO interface by introducing an electron sink of ferromagnetic $LaMnO_3$ insulator into the LAO side. This is done without formation of lattice disorder and without changing the polarity of the system, $LaAl_{1-x}Mn_xO_3/STO$ ($0 \le x \le 1$). By deliberately increasing the Mn-doping level, x, the interfacial 2DEL undergoes a Lifshitz transition [3] at x=0.225 with a critical carrier density of $n_c = 2.8 \times 10^{13}$ cm^{-2}, where a peak value of ~250 mK of superconducting transition temperature is observed. Moreover, the $LaAl_{1-x}Mn_xO_3$ turns ferromagnetic at $x \ge 0.25$. Remarkably, at a doping level of x=0.3, just before the metallic interface becomes insulating, we observed signatures of both ferromagnetism and superconductivity in the same 2DEL where the d_{xy} electrons is dominated.

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