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Tuning Valley Magnetic Moment in Bilayer MoS2 via Symmetry Control[1] SANFENG WU, Department of Physics, University of Washington, JASON ROSS, University of Washington, GUI-BIN LIU, The Univerity of Hong Kong, GRANT AIVAZIAN, AARON JONES, ZAIYAO FEI, University of Washington, WENGUANG ZHU, Oak Ridge National Lab, DI XIAO, Carnegie Mellon University, WANG YAO, The University of Hong Kong, DAVID COBDEN, Univeristy of Washington, XIAODONG XU, University of Washington — Monolayer MoS2 provides the opportunity to explore the coupled spin-valley physics arising from broken inversion symmetry. Although inversion symmetry is present in pristine bilayer MoS2, it can be broken by applying a perpendicular electric field. It offers the remarkable possibility of switching on/off and continuously tuning the physical properties of the Dirac valleys, such as valley magnetic moment and Berry curvature, by reversible electrical control. In this work, we employ polarization-resolved photoluminescence (PL) to investigate this effect using bilayer and monolayer MoS2 field effect transistors. We find that in bilayer MoS2 the circularly polarized PL can be continuously tuned from -15% to 15% as a function of gate voltage, whereas in structurally non-centrosymmetric monolayer MoS2 the PL polarization is gate-independent. The observations are well explained as resulting from the continuous variation of orbital magnetic moments between positive and negative values via symmetry control.

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