Transport and magnetic properties of digital superlattices of $(\text{LaMnO}_3)_{2n}/(\text{SrMnO}_3)_n$. A. BHATTACHARYA, Materials Science Division (MSD), Argonne National Laboratory (Argonne), J. KAVICH, Department of Physics (Physics), University of Illinois, Chicago (UIC) and Advanced Photon Source (APS), Argonne, S.G.E. TE VELTHUIS, MSD, Argonne, X. ZHAI, M. WARUSAWITHANA, Physics, University of Illinois, Urbana-Champaign (UIUC), J. FREE-LAND, APS, Argonne, SAM BADER, MSD, Argonne, J.N. ECKSTEIN, Physics, UIUC — Superlattices of $(\text{LaMnO}_3)_{2n}/(\text{SrMnO}_3)_n$, $n=1$-$5$, were synthesized using O$_3$-assisted MBE. Both constituents are antiferromagnetic insulators at low temperatures. The overall stoichiometry is the same as for La$_{2/3}$Sr$_{1/3}$MnO$_3$ random alloys, but the A-site disorder is eliminated. For $n=1$, 2 a metallic ferromagnetic state is obtained at low T. For $n=1$, all measured properties are nearly identical to those of the random alloy. The emergence of a metallic state is interpreted in terms of a Mott transition driven by the proximity between LaMnO$_3$/SrMnO$_3$ interfaces. For $n \geq 3$, a transition to an insulating state occurs, with a suppression of $T_C$ and $M_s$ and an increase in $H_c$. Using neutron and resonant x-ray scattering, we observe a modulation of the ferromagnetism commensurate with the superlattice period for $n=5$. We propose that magnetic frustration at the AF/F interfaces drives the insulating state. Ack: DOE BES contract #DE-AC02-06CH11357.

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