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Above room temperature ferroelectricity and weak ferromagnetism in $LaFeO_3$/$LnFeO_3$ digital superlattices SAURABH GHOSH, CRAIG J. FENNIE, Scholl of Applied and Engineering Physics, Cornell University — We have studied from first principles the structural, ferroelectric, and magnetic properties of the $(LaFeO_3)_1$/ $(LnFeO_3)_1$ digital superlattices, with Ln = lanthanide (or Y). We show that in this class of artificial materials constructed from Pnma perovskites, which are highly amenable to advanced oxide thin film growth techniques, octahedral rotations induce a spontaneous electrical polarization (consistent with the recently developed rules of Rondinelli and Fennie). Furthermore, this rotation pattern is shown to induce linear magnetoelectricity and weak-ferromagnetism, much like the recently discussed '327' manganite Ruddlesden-Popper. In these ferrite superlattices, however, it is clear that both the ferroelectric and magnetic ordering temperatures should occur above room temperature. Finally we discuss how the 'La/Ln' cation radius mismatch controls the magnitudes of the induced polarization and magnetization, as well as the barrier to switch the polarization.

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