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**Critical thickness for ferromagnetism in LaMnO<sub>3</sub> films**

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We studied LaMnO<sub>3</sub> (001) films, deposited by pulsed laser deposition, with thicknesses ranging from 1 unit cell to 24 unit cells. Using Scanning SQUID Magnetic Microscopy, the local magnetization was mapped for these films with micrometer resolution. We find that the magnetic ground state of the films switches sharply from antiferromagnetic to ferromagnetic state when the film thickness exceeds a critical value of 5 unit cells. The films remain electrically insulating. The magnetic transition at the critical thickness is qualitatively explained in terms of an internal electronic reconstruction in the polar LaMnO<sub>3</sub> thin films, driven by a polar catastrophe.

[1] X. Renshaw Wang et al., ArXiv 1409.0520 (2014)