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The spin state transition in $LaCoO_3$; revising a revision L. H. TJENG, M. W. HAVERKORT, Z. HU, T. BURNUS, C. ZOBEL, M. REUTHER, H. HARTMANN, T. LORENZ, II. Physikalisches Institut, Universität zu Köln, Germany, J. C. CEZAR, N. B. BROOKES, European Synchrotron Radiation Facility, Grenoble, France, A. TANAKA, Department of Quantum Matter, ADSM, Hiroshima University, Japan, H. H. HSIEH, Chung Cheng Institute of Technology, National Defense University, Taoyuan, Taiwan, H.-J. LIN, C. T. CHEN, National Synchrotron Radiation Research Center, Hsinchu, Taiwan — Using soft x-ray absorption spectroscopy and magnetic circular dichroism at the Co-$L_{2,3}$ edge we demonstrate that the spin state transition in $LaCoO_3$ can be well described by a low-spin ground state and a high-spin first excited state which becomes populated at elevated temperatures. From the temperature dependence of the spectral lineshapes we find that $LaCoO_3$ at finite temperatures is an inhomogeneous mixed-spin-state system. Crucial is that the magnetic circular dichroism signal in the paramagnetic state carries a large orbital momentum. This directly shows that the currently accepted low-/intermediate-spin picture is at variance, and that instead the original low-/high-spin scenario is the better *ansatz*.

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