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Magnetic excitations in the one-dimensional cuprate Sr_2CuO_3 probed by resonant inelastic x-ray scattering UMESH KUMAR, Univ. of Tennessee, Knoxville, JUSTIN SCHLAPPA, European XFEL Facility GmbH, Hamburg, Germany, KEJIN ZHOU, Diamond Light Source Oxford, UK, SURJEET SINGH, IISER Pune, India, VLADIMIR STROKOV, Swiss Light Source, Paul Scherrer Institut, Villigen, Switzerland, ALEXANDRE REVCOLEVSCHI, Universit Paris-Sud , Orsay Cedex, France, HENRIK RONNOW, Ecole Polytechnique Federale de Lausanne (EPFL), Lausanne, Switzerland, STEVEN JOHNSTON, Univ. of Tennessee, Knoxville, USA, THORSTEN SCHMITT, Swiss Light Source, Paul Scherrer Institut, Villigen, Switzerland — We present a resonant inelastic x-ray scattering (RIXS) study of low energy spectra at the oxygen K-edge of Sr_2CuO_3. The experimental data shows the presence of several low-energy excitations in the quasi-elastic region (ω<0.5 eV), which we associate with magnetic and lattice excitations. We investigate the system using a one dimensional antiferromagnetic Heisenberg chain comprising of copper and oxygen. Using linear spin wave theory, we compute the RIXS cross section in the ultrashort core-hole lifetime approximation to second order and demonstrate the presence of two-magnon excitations in the low-energy region. Phonon and phonon assisted two-magnon excitations are also calculated within our approach. Our analysis establishes that the two-magnon excitations and phonon excitations are present in Sr_2CuO_3, indicating that this is potentially an ideal system for studying possible spin-lattice coupling.

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