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Far-infrared study of gapped spin excitations in the chains of $Sr_{14}Cu_{24}O_{41}$ DAN HUVONEN, U. NAGEL, T. ROOM, Natl. Inst. of Chem. Physics and Biophysics, P. HAAS, B. GORSHUNOV, M. DRESSEL, 1. Phys. Inst., Uni. Stuttgart, Y.-J. WANG, NHMFL, J. AKIMITSU, T. SASAKI, T. NAGATA, Dept. of Physics, Aoyama-Gakuin Uni. — We studied using far-infrared spectroscopy, magnetic field and temperature dependence of the spin gap modes in the chains of $Sr_{14}Cu_{24}O_{41}$. Two triplet modes T_1 and T_2 were found in the center of the Brillouin zone at E_1=77.8 cm^{-1}(9.65 meV) and E_2=87.7 cm^{-1}(10.86 meV) in zero magnetic field. Both excitations are electric dipole active modes. T_1 mode is excited when the light E-vector is along the *b* crystallographic axis and T_2 is excited when the light E-vector is along the *a*-axis, both perpendicular to the chain direction. The selection rules of the transitions are compatible with dynamic Dzyaloshinskii-Moria interaction mechanism. Up to the field of 18T the electron g-factors of two modes are similar, g_{1c}=2.049 and g_{2c}=2.055 with magnetic field applied along the chains. Linewidth of both modes is 1 cm^{-1} (0.12 meV) at 4K and increases with T. The temperature dependence of the mode energies is in agreement with the inelastic neutron scattering (INS) results from other groups. However the T_1 mode has not been observed by INS. The zone structure model of magnetic excitations in the chains is not complete and must include a triplet mode at 9.65 meV in the center of the magnetic Brillouin zone.

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