Charge character of the static `stripe' phase in $La_{2-x}Ba_xCuO_4$

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Stripe phases were predicted to arise in copper oxides through competition between antiferromagnetism and the kinetic energy of doped holes. The strongest evidence for stripes is neutron scattering from $La_{1.48}Nd_{0.4}Sr_{0.12}CuO_4$ (LNSCO) and $La_{1.875}Ba_{0.125}CuO_4$ (LBCO) which reveals coexisting spin and charge order whose wavelengths differ by a factor of two, reminiscent of charged rivers separating regions of oppositely-phased antiferromagnetism. Such a factor of two, however, is also seen in charge scattering from the spin density wave in Cr, and anyway a neutron is electrically neutral so detects only distortions in the crystal structure. It is not known if the `stripe' phase in LNSCO and LBCO actually involves ordering of the doped holes. I will present a study of LBCO with resonant soft x-ray scattering (RSXS) which is directly sensitive valence band ordering. Charge `stripe' scattering was seen to exhibit giant resonances at the mobile hole and upper-Hubbard band features below the O_K edge, demonstrating direct participation of the doped holes. The peak-to-trough valence amplitude is estimated to be 0.063 holes which suggests, within a specific model of the stripe form factor, an integrated area of 0.59 holes under one stripe. This is in reasonable agreement with half-filled stripes.