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Abstract With the aim of tracing the assembly of massive galaxies through cosmic time, spectroscopic redshifts have been measured for a sample of K-band luminous galaxies (Ks<20) at 1.7<z<2.3, selected in a field covered by both the K20 and the GOODS Surveys. Fitting of their multi-color spectral energy distributions indicates stellar masses M=~10^{11} Msun or more for most of the program galaxies, while extinction corrected star formation rates (SFRs) of 100--500 Msun/yr are derived. Their rest-frame UV morphologies from HST/GOODS imaging are highly irregular, suggesting that merging-driven starbursts are going on in these galaxies. Morphologies tend to be more compact in the near-IR, a hint for the possible presence of older stellar populations. Such galaxies are strongly clustered, with the majority belonging to redshift spikes, which indicates a correlation length r_o = (9-17) h Mpc (1 sigma range). Current semianalytical models of galaxy formation appear to underpredict by more than an order of magnitude the number density of such a population of massive and powerful starburst galaxies at z=2. The high masses and SFRs together with the strong clustering suggest that at z=2 we may have started to explore the major formation epoch of massive early-type galaxies.