



**Extended Data Figure 4 | Composition-dependent ensemble photoluminescence decay measurements of lead halide perovskite nanocrystals.** **a**, Typical streak-camera measurement of the photoluminescence from an ensemble of CsPbBr<sub>2</sub>Cl nanocrystals at 5 K. In this example, the nanocrystals have  $L = 14$  nm. The emission peak is centred at 2.51 eV, and the exponential decay time is 210 ps, as extracted by summing over all energies, which is in good agreement with the results for single CsPbBr<sub>2</sub>Cl nanocrystals of the same size. The ensemble decay spectrum is slightly asymmetric (being faster at higher energies), which might originate from the activation of an energy-transfer process from

smaller to larger nanocrystals. To account for this effect, we considered only the long component of the decay curve. **b**, Photoluminescence lifetimes at 5 K extracted for ensemble samples of nanocrystals (NCs) of various compositions and sizes (as labelled). The ensemble data (solid circles) are compared with single-nanocrystal measurements (open circles). The good agreement between the two datasets is further evidence that the measured single-nanocrystal photoluminescence decays are due to fast exciton radiative lifetimes and not to trions, because the ensemble data are acquired at very low excitation power, at which photo-generated charging is not observed.