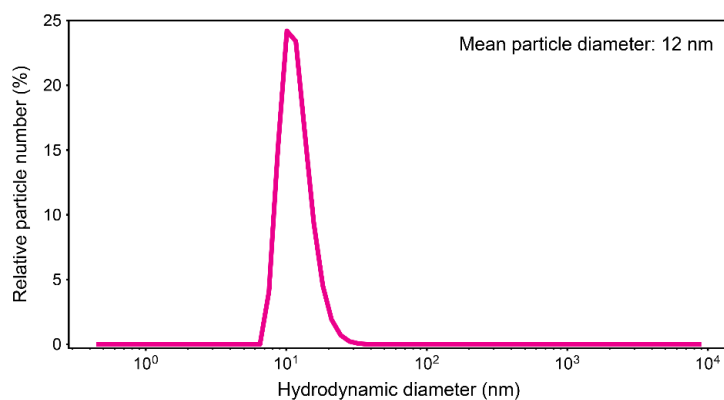
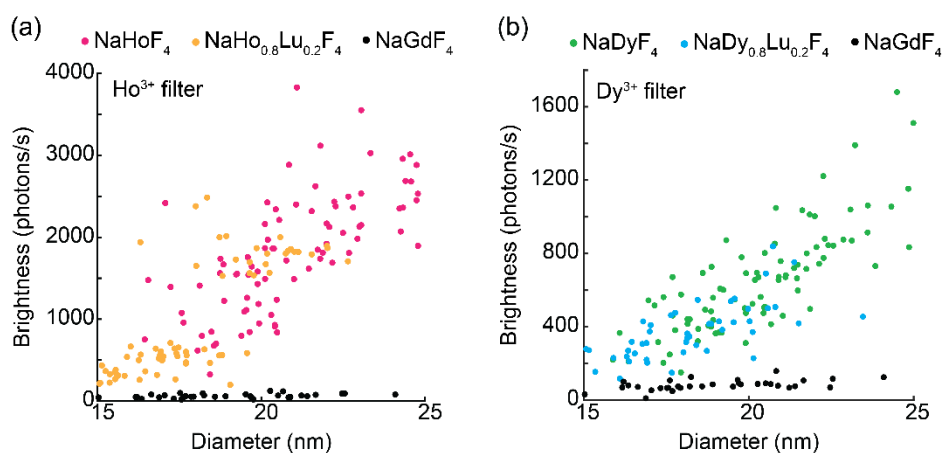


Supplementary Figure 1: TEM images of LNPs. TEM characterization of (a) $\text{NaHo}_{0.8}\text{Lu}_{0.2}\text{F}_4$, (b) $\text{NaDy}_{0.8}\text{Lu}_{0.2}\text{F}_4$, and (c) NaTbF_4 LNPs. Images were acquired at 200 keV beam energy using a JEOL JEM-F200 S/TEM in TEM mode. Scale bars: 100 nm.



Supplementary Figure 2: DLS with hexane-suspended LNPs. Particle number distribution from DLS measurements of $\text{NaHo}_{0.8}\text{Lu}_{0.2}\text{F}_4$ LNPs in n-hexane. Mean particle diameter was 12.0 ± 3.2 nm.



Supplementary Figure 3: Brightness of LNPs when co-doped with Lu^{3+} ions. (a) Brightness of NaHoF_4 and $\text{NaHo}_{0.8}\text{Lu}_{0.2}\text{F}_4$ LNPs in the Ho^{3+} filter as a function of LNP diameter. (b) Brightness of NaDyF_4 and $\text{NaDy}_{0.8}\text{Lu}_{0.2}\text{F}_4$ LNPs in the Dy^{3+} filter as a function of LNP diameter. Brightness of control NaGdF_4 LNPs is also shown in the respective filters for comparison.