## **Supporting Information**

## Two-photon Pumped Amplified Spontaneous Emission and Lasing

## from Formamidinium Lead Bromine Nanocrystals

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**Figure S1.** The process for the preparation of colloidal FAPbBr<sub>3</sub> nanocrystals solution.



Figure S2. PL decay dynamics of FAPbBr<sub>3</sub> NCs under different pump fluence of 405 nm excitation wavelength.

405 nm excitation	$\tau_1(ns)$	<b>f</b> <sub>1</sub> (%)	$\tau_2(ns)$	f <sub>2</sub> (%)	$\tau_3(ns)$	f <sub>3</sub> (%)
10 µW	3.42	34.13	26.83	65.87	-	-
100 µW	3.64	47.05	13.22	24.54	0.84	28.41

Table S1. The lifetime parameters of  $FAPbBr_3 NCs$ .



Figure S3. Pump-intensity dependence of the emission from the FAPbBr<sub>3</sub> nanocrystals film under 400 nm fs laser excitation, the pump intensity is increased from 10 to 150  $\mu$ J/cm<sup>2</sup>.



Figure S4. The dependence of output intensity and linewidth as a function of pumping density of FAPbBr<sub>3</sub> nanocrystals under 400 nm fs laser excitation, showing the threshold of  $\sim$ 57 µJ/cm<sup>2</sup>.



Figure S5. One-photon-pumped microring lasing from FAPbBr<sub>3</sub> NCs (excited by 400 nm fs laser).