Supporting Information for the manuscript:

"Circularly Polarized Photoluminescence and Hanle Effect Measurements of Spin Relaxation in Organic-inorganic Hybrid Perovskite Films"

S1. Estimation film thickness using absorbtance at room temperature

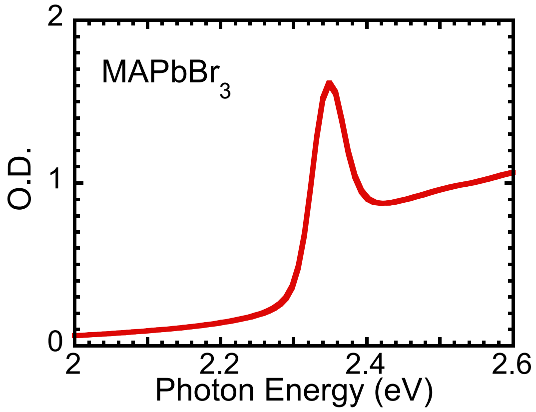

Figure S1: the absorption spectrum of $MAPbBr_3$ film at room temperature, which is used to estimate the thickness of the films

In Yang et al. (*Journal of Physical Chemistry Letters*, **6**, 4688(2015)), 86 nm thickness of $MAPbBr_3$ film was obtained, with Optical Density of 0.4 at 2.35 eV at room temperature (RT). Their fabrication procedure was same with ours except for coating speed.

The absorption spectrum of a film from same group of samples for measuring CPL in manuscript was measured at RT and shown in Fig. S1, the O.D. is about 1.67 at 2.35 eV. According to the equation O.D.=$0.434\alpha d$ (*Optical Properties of Solids*, **2001**, Oxford University Press Inc.), in which α stands for absorption coefficient and d stands for film thickness, the film thickness was estimated to be 360 nm for our $MAPbBr_3$ film if the α is assumed to be same.

Similarly, the thickness of $MAPbI_3$ film was estimated to be 350 nm in this work.

S2. Circular dichroism measurements at room temperature

Circular dichroism (CD) is related to difference between absorption cross sections for left-handed and right-handed circularly polarized light, which seems unlikely in perovskite. However, if CD did exist in perovskite for some reason, naturally the emission would be circularly polarized, no matter what the polarization and wavelength of excitation source.

We measured circularly dichroism at RT (Fig. S2 following). For small circular dichroism (CD) effects, θ (radians) = $(I_R^{1/2}-I_L^{1/2})/(I_R^{1/2}-I_L^{1/2})$, where I_R and I_L is the intensity of the right-circularly and left-circularly polarized light, respectively. For small circular dichroism ($I_R^{1/2} \approx I_L^{1/2} = I$), $\theta = \Delta I/4I$. Then ΔI, the difference in absorbance of R-CPL and L-CPL in $MAPbBr_3$ film at room temperature is smaller than 10^(-5) of absorbance, which suggests the $MAPbBr_3$ have no CD intrinsically at RT. However, we cannot reach facilities to measure CD low temperature. There are two experimental components to convince that the CPL results from band structure, not from optical properties such as birefringence: 1) zero CPL excited by linear polarized laser. 2) Large difference between polarization ratios excited by resonant and non-resonant lasers.

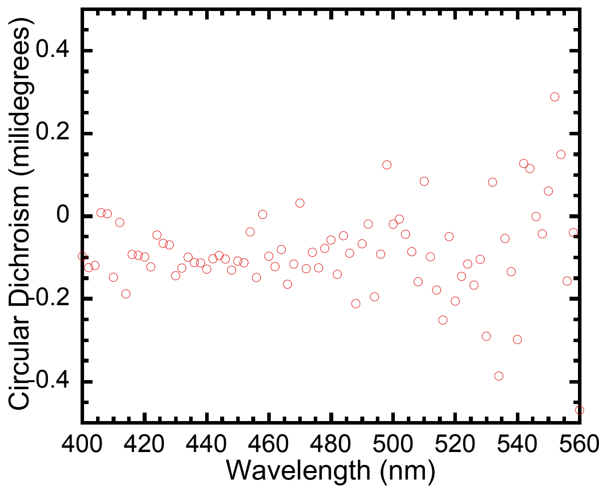

Figure S2: circular dichroism spectra of a $MAPbBr_3$ film measured at room temperature.

S3. Schematic setup for circularly polarized luminescence (CPL) measurement and the estimation of its sensitivity.

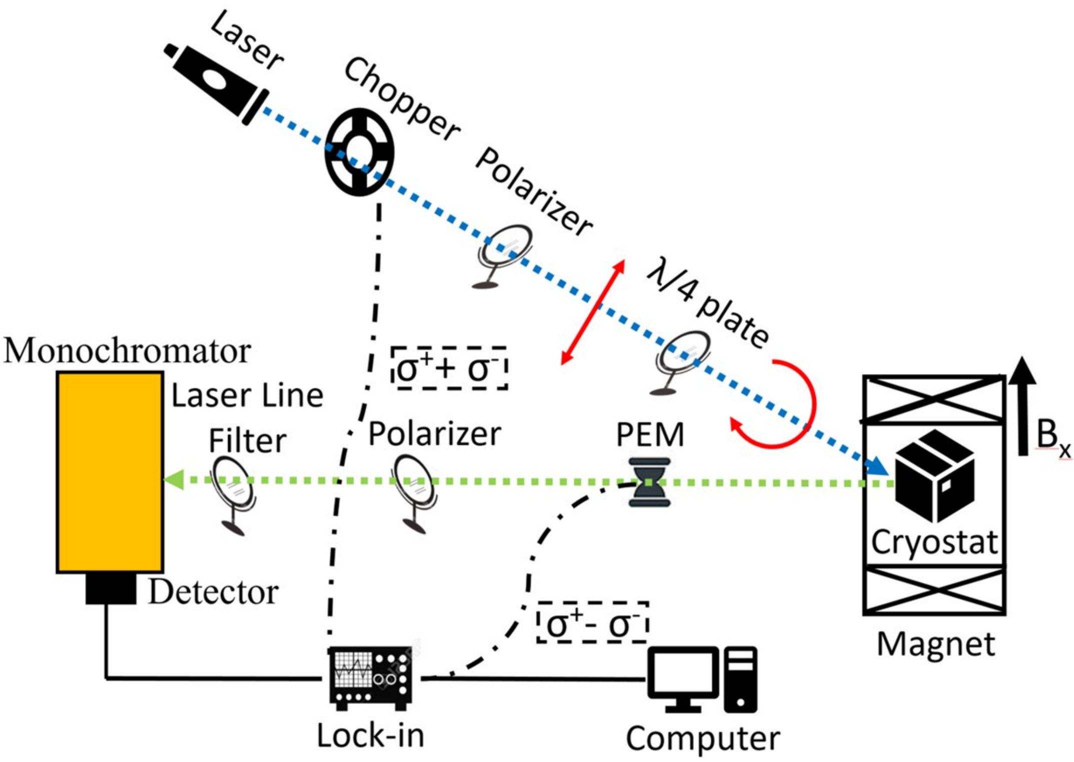

Figure S3. Schematic setup for circularly polarized luminescence (CPL) measurements. PEM: photo-elastic modulator.

The MEH-PPV powder was dissolved in Toluene and the solution was spin-coated on a cleaned glass substrate which was same with substrate for perovskites. In Figure S4, we showed PL and CPL of MEH-PPV film, respectively. The signal between 560 nm to 570 nm of CPL was averaged as noise level. Then the spectrum of P was calculated after subtracting noise (Fig. S4(b)). Conservatively, we estimated 0.01% is the system sensitivity for P measurements

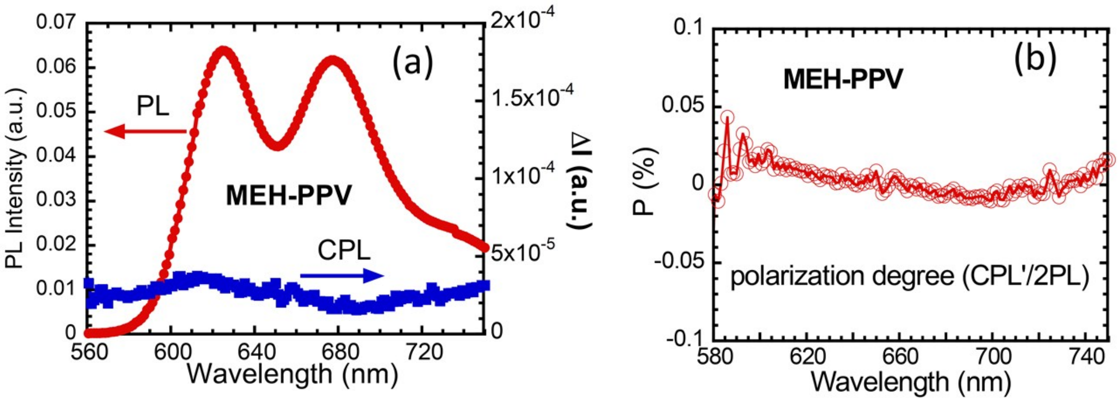

Figure S4. Photoluminescence (PL) and circularly polarized photoluminescence (CPL) spectra (a), as well as its polarization degree (b), from a MEH-PPV film measured at 77K excited by a 532nm laser.