Supporting Information

Anti-Stokes Ultraviolet Luminescence and Exciton Detrapping in the Two-Dimensional Perovskite $(\text{C}_6\text{H}_5\text{C}_2\text{H}_4\text{NH}_3)_2\text{PbCl}_4$

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Figure S1. Photoluminescence excitation spectra of STE emission monitoring at 580 nm in 10 K.
**Figure S2.** Experimental decay curves of 510 nm self-trapped exciton emission under 579 nm laser excitation and the red line shows the fitting results of the build-up component and the decay components.
Table S1. Calculated average lifetime of \((\text{PEA})_2\text{PbCl}_4\) under different excitation energy.

<table>
<thead>
<tr>
<th>PL Wavelength (nm)</th>
<th>(\tau_{\text{avg} \text{ Ex} = 266 \text{ nm} \ (\mu\text{s})})</th>
<th>(\tau_{\text{avg} \text{ Ex} = 579 \text{ nm} \ (\mu\text{s})})</th>
</tr>
</thead>
<tbody>
<tr>
<td>347</td>
<td>0.433</td>
<td>0.566</td>
</tr>
<tr>
<td>510</td>
<td>2.67</td>
<td>3.25</td>
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</table>
Figure S3. (a) The photoluminescence spectra of the (PEA)$_2$PbCl$_2$Br$_2$ perovskite powder under the excitation of 355 nm Nd:YAG laser at 10 K. (b) The up-conversion spectra of FE and STE of the (PEA)$_2$PbBr$_2$Cl$_2$ under the excitation of 579 nm dye laser at 10 K.
**Figure S4.** Raman vibrational spectra of the \((\text{PEA})_2\text{PbCl}_4\) perovskite powder.