Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Photoluminescence and lasing properties of $MAPbBr_3$ single crystals grown from solution[1] SANDIP ARYAL, EVAN LAFALCE, CHUANG ZHANG, YAXIN ZHAI, Z. VALY VARDENY, University of Utah — Recent studies of solution-grown single crystals of inorganic-organic hybrid lead-trihalide perovskites have suggested that surface traps may play a significant role in their photophysics. We study electron-hole recombination in single crystal $MAPbBr_3$ through such trap states using cw photoluminescence (PL) and ps transient photoinduced absorption (PA) spectroscopies. By varying the depth of the collecting optics we examined the contributions from surface and bulk radiative recombination. We found a surface dominated PL band at the band-edge that is similar to that observed from polycrystalline thin films, as well as a weaker red-shifted emission band that originates from the bulk crystal. The two PL bands are distinguished in their temperature, excitation intensity and polarization dependencies, as well as their ps dynamics. Additionally, amplified spontaneous emission and crystal-related cavity lasing modes were observed in the same spectral range as the PL band assigned to the surface recombination.

[1]This work was funded by AFOSR through MURI grant RA 9550-14-1-0037.

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Date submitted: 05 Nov 2015 Electronic form version 1.4