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Hyperfine structures of the $B^1\Pi$, $c^3\Sigma^+$, and $b^3\Pi$ states of ultracold ^{85}Rb^{133}Cs via short range photoassociation JIN-TAE KIM, Photonic Eng., Chosun Univ., Korea, TOSHIHIKO SHIMASAKI, YUQI ZHU, DAVID DEMILLE, Dept. of Physics, Yale Univ., USA — Short-range photoassociation (PA) has opened up to investigate various hyperfine structures of deeply bound rovibrational levels of the strongly perturbed $B^1\Pi$, $c^3\Sigma^+$, and $b^3\Pi$ states with high resolution of ˜10 MHz. Peculiar potential curves of the electronic states with crossings and inflections obtained from Fourier-transform spectroscopy (FTS) with low resolution of 900 MHz [1] give strong evidences for strong spin-orbit coupling effects between the singlet and triplet states. We have observed new short-range PA lines of the $B^1\Pi(\Omega = 1)$, $b^3\Pi(\Omega = 0^-, 0^+,$ and 1), and $3^3\Sigma^+(\Omega = 0^-$and 1) states of ultracold ^{85}Rb^{133}Cs molecule, starting with ^{85}Rb and ^{133}Cs atoms trapped in their $|F_{Rb} = 2\rangle$and $|F_{Cs} = 3\rangle$hyperfine states in dark SPOT MOTs. We have observed rich hyperfine structures of the $B^1\Pi$, $c^3\Sigma^+$, and $b^3\Pi$ states with $\Omega = 1$, which were not observed in the FTS [1]. We will discuss the various hyperfine structures in comparisons with the hyperfine structures observed in PA to the $2^3\Pi(\Omega = 1)$, $2^1\Pi(\Omega = 1)$, and $3^3\Sigma^+(\Omega = 1)$ states [2]· [1] I. Birzniece *et al.*, J. Chem. Phys. **138**, 154304 (2013). [2] T. Shimasaki *et al.*, ChemPhysChem **17**, 3677 (2016).

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