Supplementary materials for tuning ferromagnetic BaFe$_2$(PO$_4$)$_2$ through a high Chern number topological phase

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FIG. 1: (color online) Orbital $\sum_n \langle \phi_{kn} | \vec{l} | \phi_{kn} \rangle$ and spin $\sum_n \langle \phi_{kn} | \vec{s} | \phi_{kn} \rangle$ textures in a square region in $k$ space. The axes are along Cartesian axes; $\Gamma$ is at the near corner, $M$ is midway along the diagonal toward the far corner, the vortices circle the $K, K'$ points. The orbital texture in the Chern phase ($U=2$ eV) are shown for each band in (a,c) and for the trivial Mott insulator ($U=3$ eV) in (b,d). The corresponding spin textures are shown in the lower four panels. The color denotes the $\hat{z}$ component of the texture field, with positive being parallel to the spin orientation, i.e., $\hat{c}$-direction, while the arrow provides the direction.