

Title: Supplementary Movie 1

Legend: Impulsive spin excitation considering only the field-like torque. The effective magnetic field $\mathbf{H}_{\text{IFE}}$ of the IFE induces a spin canting perpendicular to $\mathbf{H}$. A net magnetization only occurs during the spin precession following the excitation.

Title: Supplementary Movie 2

Legend: Impulsive spin excitation via the combined effect of fieldlike and damping-like torques. The damping-like torque induces a net magnetization during the excitation: A highly efficient to handle to excite spin dynamics in antiferromagnets.