Proposed Optical/Microwave Manipulations of Nanoscale Spin Textures: Multiferroics and Skyrmions

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We theoretically explore the ways to manipulate nanoscale spin textures such as transverse spin spiral with a vector spin chirality, magnetoelectric (ME) domain wall, and swirling spin structure (skyrmion) by irradiating THz and microwave laser pulses using (electro-)magnon resonances.
Following subjects will be discussed:

[1] Mechanism of electrically activated magnon excitations via ME coupling in spin-spiral-based multiferroics $RMnO_3$, and picosecond optical switching of spin chirality through intensely exciting the electromagnons.
>   **M. Mochizuki**, N. Furukawa, N. Nagaosa, Phys. Rev. Lett. 104, 177206 (2010).
>   **M. Mochizuki** and N. Nagaosa, Phys. Rev. Lett. 105, 147202 (2010).
>   **M. Mochizuki** and N. Nagaosa, arXiv/1102.3762.

[2] Microscopic structures of ME domain walls in multiferroics, their dielectric responses, giant magnetocapacitance effect, and salient dependence on the propagation wave number of the spiral magnetism.
>   **Now under calculation!**
>   See also **F. Kagawa, M. Mochizuki** et al., Phys. Rev. Lett. 102, 057604 (2009).

[3] Magnon modes in the skyrmion-crystal (SkX) phase of chiral magnets, strong dependence on the circular polarization of the irradiating microwave, and melting of the SkX accompanied by a red shift of the magnon frequency under irradiating microwaves.
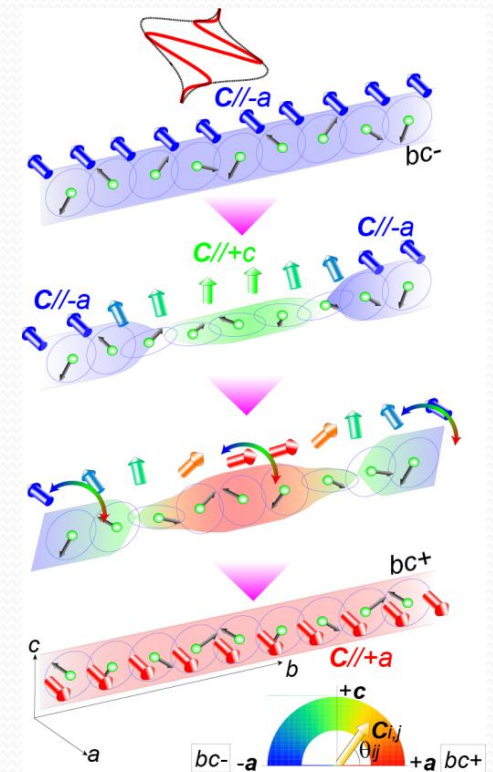>   **Submitted!**

Fig.1: Reversal of spin chirality in the spin-spiral multiferroics after irradiating a THz laser pulse.