

# Magnetic field control of light-induced spin accumulation in monolayer MoSe<sub>2</sub>

This document is provided to the reader under the “data availability” directive

The following information introduce the files on a per-figure basis.

- Figure 1
  - Figure 1a: Artistic representation. No experimental data available.
  - Figure 1b: Artistic representation. No experimental data available.
  - Figure 1c: TRKR in a short time scale at -5 T (both polarizations)
    - [Figure\\_1\Fig\\_1c\\_\\_TRKR\\_1L\\_MoSe2\\_6K\\_755nm\\_-5T.csv](#)
  - Figure 1d: TRKR in a short time scale at 0 T (both polarizations)
    - [Figure\\_1\Fig\\_1c\\_\\_TRKR\\_1L\\_MoSe2\\_6K\\_755nm\\_0T.csv](#)
  - Figure 1e: TRKR in a short time scale at 5 T (both polarizations)
    - [Figure\\_1\Fig\\_1c\\_\\_TRKR\\_1L\\_MoSe2\\_6K\\_755nm\\_5T.csv](#)
- Figure 2
  - Figure 2a: TRKR in a long time scale at -5 T (both polarizations)
    - [Figure\\_2\Fig\\_2a\\_\\_TRKR\\_1L\\_MoSe2\\_6K\\_755nm\\_-5T.csv](#)
  - Figure 2b: TRKR in a long time scale at 5 T (both polarizations)
    - [Figure\\_2\Fig\\_2b\\_\\_TRKR\\_1L\\_MoSe2\\_6K\\_755nm\\_5T.csv](#)
  - Figure 2c: Fitting parameters – slow decay time  $t_2$ 
    - $\sigma^+$  polarization excitation: [Figure\\_2\Fig\\_2c2d\\_Fig\\_S3\\_\\_TRKR\\_fit\\_param\\_1L\\_MoSe2\\_755nm\\_Pu\\_184uW\\_Pr\\_15uW\\_5p9K\\_sigma\\_m.csv](#)
    - $\sigma^-$  polarization excitation: [Figure\\_2\Fig\\_2c2d\\_Fig\\_S3\\_\\_TRKR\\_fit\\_param\\_1L\\_MoSe2\\_755nm\\_Pu\\_184uW\\_Pr\\_15uW\\_5p9K\\_sigma\\_m.csv](#)
  - Figure 2d: Fitting parameters – slow decay amplitude  $A_2$ 
    - $\sigma^+$  polarization excitation: [Figure\\_2\Fig\\_2c2d\\_Fig\\_S3\\_\\_TRKR\\_fit\\_param\\_1L\\_MoSe2\\_755nm\\_Pu\\_184uW\\_Pr\\_15uW\\_5p9K\\_sigma\\_m.csv](#)
    - $\sigma^-$  polarization excitation: [Figure\\_2\Fig\\_2c2d\\_Fig\\_S3\\_\\_TRKR\\_fit\\_param\\_1L\\_MoSe2\\_755nm\\_Pu\\_184uW\\_Pr\\_15uW\\_5p9K\\_sigma\\_m.csv](#)
- Figure 3
  - Figure 3a: Time-resolved Kerr rotation polarization for various wavelengths
    - Difference of the KR signals  $(\sigma_+ - \sigma_-)/2$ . As in Figure 3a: [Figure\\_3\Fig\\_3a\\_\\_KR\\_Polarization\\_1L\\_MoSe2\\_6K\\_0T\\_wl.csv](#)
    - TRKR data by wavelength (both polarizations): [Figure\\_3\Figure\\_3a\ ...](#)
  - Figure 3b: Photoluminescence spectra:
    - $\sigma^-$ : [Figure\\_3\Figure\\_3b\20220607\\_PL\\_1L\\_MoSe2\\_100uW\\_6K\\_20sx3\\_A\\_45\\_B\\_0T\\_1.txt](#)
    - $\sigma^+$ : [Figure\\_3\Figure\\_3b\20220607\\_PL\\_1L\\_MoSe2\\_100uW\\_6K\\_20sx3\\_A\\_135\\_B\\_0T\\_2.txt](#)
  - Figure 3b Inset: KR Polarization time profiles
    - [Figure\\_3\Fig\\_3b\\_Inset\\_KR\\_wl\\_profiles\\_1L\\_MoSe2\\_6K\\_755nm\\_0T.csv](#)

- Figure 3c: TRKR in a short time scale at -5 T and 765 nm excitation (both polarizations)
  - [Figure\\_3\Fig\\_3c\\_\\_TRKR\\_1L\\_MoSe2\\_6K\\_765nm\\_-5T.csv](#)
- Figure 3d: TRKR in a short time scale at 5 T and 765 nm excitation (both polarizations)
  - [Figure\\_3\Fig\\_3d\\_\\_TRKR\\_1L\\_MoSe2\\_6K\\_765nm\\_5T.csv](#)
- Figure 4
  - Figure 4a: Experimental data - TRKR in a long time scale at 0 T (both polarizations)
    - [Figure\\_4\Fig\\_4a\\_\\_TRKR\\_1L\\_MoSe2\\_6K\\_755nm\\_0T.csv](#)
  - Figure 4b: Experimental data - TRKR in a long time scale at 0 T (both polarizations)
    - Same as Figure 2b: [Figure\\_2\Fig\\_2b\\_\\_TRKR\\_1L\\_MoSe2\\_6K\\_755nm\\_5T.csv](#)
  - Figure 4c: Artistic representation. No experimental data available.
  - Theoretical data available upon reasonable request.

Additional Experimental data:

We have also included the full set of TRKR measurements with magnetic field dependence (Presented in the Figure S10 of the supplementary information).

[\TRKR\\_Magnetic\\_field\\_raw\\_dataset](#)

We have included the data acquired at the short time scale

[\TRKR\\_Magnetic\\_field\\_raw\\_dataset\Short\\_time\\_scale](#)

as well as the long time scale:

[\TRKR\\_Magnetic\\_field\\_raw\\_dataset\Long\\_time\\_scale](#)

Finally, we included the (removed) offset of the KR signal at each magnetic field, determined as the average of all the KR data points previous to the pump pulse ( $dt < -0.2$  ps)

[\TRKR\\_Magnetic\\_field\\_raw\\_dataset\Short\\_time\\_scale\KR\\_offset\\_vs\\_B\\_1L\\_MoSe2\\_6K\\_755nm\\_short\\_scale.csv](#)

[\TRKR\\_Magnetic\\_field\\_raw\\_dataset\Long\\_time\\_scale\KR\\_offset\\_vs\\_B\\_1L\\_MoSe2\\_6K\\_755nm\\_long\\_scale](#)