Supplemental Information for: Perspective: Multi-Dimensional Coherent Spectroscopy of Perovskite Nanocrystals

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EXPERIMENTAL SCHEMATIC

For concreteness, we give an experimental schematic of an MDCS experiment utilizing wave-vector phase-matching:

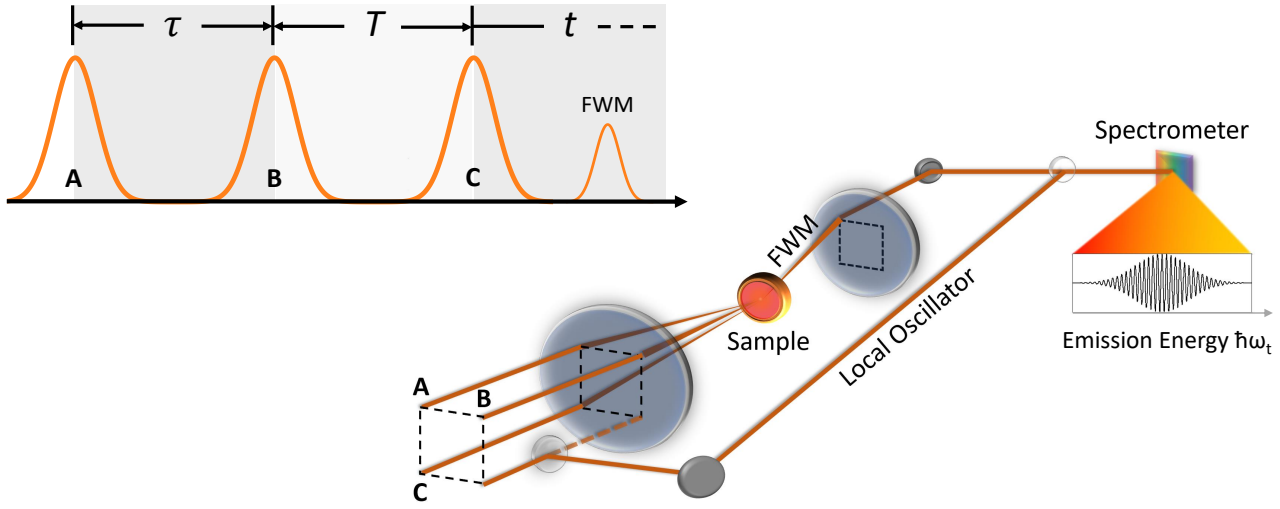

FIG. 1. MDCS time-delays are described in the top left, with a corresponding wave-vector phase-matching experimental schematic shown in the bottom right. The schematic shown here is of course only one possible implementation of MDCS, with many others described in the literature [1, 2].

The three excitation pulse {A,B,C} are focused onto the sample in the so-called BOXCARS geometry, in which the four-wave mixing (FWM) signal is emitted in a unique, background-free direction. For phase-sensitive detection, the FWM signal is combined with a separate, phase-stable local oscillator pulse and spectrally resolved by a grating spectrometer. Note that this spectrometer performs a Fourier transform along the time-delay t, leaving only two other time-delays $\{\tau, T\}$ to be varied.

[1] F. D. Fuller and J. P. Ogilvie, Experimental implementations of two-dimensional fourier transform electronic spectroscopy, Annual Review of Physical Chemistry **66**, 667 (2015).
[2] G. Nardin, T. M. Autry, G. Moody, R. Singh, H. Li, and S. T. Cundiff, Multi-dimensional coherent optical spectroscopy of semiconductor nanostructures: Collinear and non-collinear approaches, Journal of Applied Physics **117**, 112804 (2015).