FACOLTÀ DI SCIENZE MATEMATICHE, FISICHE E NATURALI
DIPARTIMENTO DI MATEMATICA E FISICA "NICCOLÒ TARTAGLIA"
INTERNATIONAL DOCTORAL PROGRAM IN SCIENCE

Coherent control of electronic dynamics in layered quantum materials

Speaker:
MOHAMMADJAVAD AZARM
Università Cattolica del Sacro Cuore

Chair:
CASSIO CRISTANI
Università Cattolica del Sacro Cuore

Two-dimensional (2D) transition metal dichalcogenides (TMDs), such as MoS2, MoTe2, WS2, etc., exhibit remarkable physical properties resulting from reduced dimensionality and crystal symmetry. TMDs with potential applications in phototransistors, sensors, logic circuits, light-producing and harvesting devices, etc., mark a new frontier in condensed matter physics. To investigate the decoherence dynamics of optical and electronic excitations in nanostructured correlated materials like TMDs we develop a coherent 2-dimensional electron spectroscopy (2DES) experiment. 2DES measures the third-order material coherent polarization by exploiting two coherent phase-locked pulses acting as a pump, and a third pulse acting as a probe, allowing for simultaneous resolution of excitation and detection frequency axes with fs temporal resolution. 2DES allows to investigate the population relaxation time and the decoherence time of relevant modes. Also 2DES will be used to probe the decoherence dynamics of light-induced exciton gases in 2D materials (TMDs and oxides). In particular, we will look for signatures of modification of the intrinsic decoherence dynamics driven by: i) coherent interactions within the exciton gas; ii) coupling of inter-layer excitonic modes in var der Waals (vdW) heterostructures; iii) coupling to cavity modes.

PhD Seminar

22nd March 2023
Sala Riunioni S5, 15.40
via Garzetta 48, Brescia

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