

D2.2.1 Investigate that 2D electronic spectroscopy (2DES) can be efficiently used for optical addressing

M12, WP2

Lead beneficiary: P3, UNIPD

In collaboration with **WP1**, we explored the possibility of effectively use 2DES maps to generate multivariate logic. In [B. Fresch et al., PNAS, 2013] a molecular decision tree scheme was proposed and implemented onto 2D spectra. This allowed us understanding which experimental variables could be considered as input and which spectroscopic observables could be considered as the corresponding output. This work represents the theoretical demonstration that 2DES can be efficiently used for optical addressing and how a 2D map can be interpreted as a multidimensional output map of a molecular machine.

Basing on these theoretical findings and predictions, in collaboration with **WP4**, we designed and prepared Donor(D)-Acceptor(A) systems in which the D and A moieties are conveniently coupled to DNA duplex to guarantee suitable distances and orientations. We prepared three different complexes characterized by different distances between the D and A moieties. The photophysical and dynamic properties of such systems were preliminary characterized by 1D frequency- and time-resolved techniques and are currently under investigation through 2DES technique. The delay in the characterization of such samples through 2DES is motivated by technical problems with the laser source necessary for the experiments as described above.

Fresch B, Hiluf D, Collini E, Levine RD, & Remacle F (2013) Molecular decision trees realized by ultrafast electronic spectroscopy *Proceedings of the National Academy of Sciences* 110:17183-17188.