Solid State Institute
המכון למצב מוצק

TECHNION
Israel Institute of Technology
הטכניון
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SPECIAL SEMINAR

סמינר מיוחד

Is high harmonic generation sensitive to chirality?

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Abstract

The high harmonic spectroscopy (HHS) has been established as a new spectroscopic technique capable of providing structural and dynamical information on the systems used as generation medium (atoms, molecules, clusters, nanoparticles, solids) with unparalleled temporal resolution. This technique consists of measuring the spectrum of the coherent radiation emitted as high-order harmonics of the driving field frequency by the medium subjected to strong laser fields. The spectrum, phase and polarisation of the harmonics are sensitive to molecular information, as for example, the structures and symmetries of the highest occupied molecular orbitals (HOMO, HOMO-1,…), vibrations, rotational dynamics and molecular alignment and orientation. We have explored the sensitivity of the HHG process to a more subtle orientational aspect of the generating medium: the handedness of chiral molecules.

We have employed elliptically polarised driving laser field at 1800 nm to generate HH in gas-phase enantiopure samples of Fenchone and of Propylene Oxide. The slight disparity in the laser-driven electron dynamics induced in the enantiomers is recorded and amplified by several orders of magnitude in their HH spectra as elliptical dichroism (ED) of opposite sign. The ED is particularly large, reaching a magnitude of ~10%, even for ellipticities of albeit 1%. The absolute value of the ellipticity that maximise the yield of individual harmonics reflects the chiral electron dynamics induced by the strong laser field. This dynamics occurs during the laser cycle and thus, it is mapped with 100 as resolution, which corresponds to the difference in the emission times of individual HH. In addition, the molecular chirality reveals the influence of the magnetic field component of the laser field on the high harmonic generation process. The extreme sensitivity of HHG to chirality make of it a powerful spectroscopic tool for investigating chirality on fs and as timescales.

R. Cireasa et al., Nat. Phys. 11, 654 (2015)

ההרצאה תתקיים ביום שני, ה-11.6.18 בשעה 12:30
באודיטוריום המכון למצב מוצק, קומת כניסה

The lecture will take place on Monday, 11.6.18 at 12:30
at the Solid State Institute auditorium, entrance floor

Host: Associate Professor Oren Cohen