



Tuesday, February 4th, 2020 – 15:00
CFEL Seminar room I (Bldg. 99)

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Symmetries in high harmonic generation and their application to novel ultrafast spectroscopies

The analysis of symmetries and their associated selection rules is extremely useful in many fields of science. The field of nonlinear optics is no exception. In the early days of nonlinear optics, symmetries were used to derive whether particular nonlinear optical processes are allowed/forbidden according to the medium's point-group. This approach is believed to be complete, and is regularly taught in graduate classes.

I will present a more general (and closed-form) group-theory analysis for the role of symmetries in harmonic generation. Within this approach, both the symmetries of the nonlinear medium (gas, liquid, or solid), and the dynamical symmetries of the incident laser field, are fully taken into account. The theory leads to many new symmetries and selection rules for light-matter interactions that are useful for a variety of applications, e.g. controlling the properties of extreme UV light. I will also discuss the role of symmetry and symmetry-breaking in high harmonic spectroscopy. Specifically, I will focus on ultrafast detection of chirality, and atomic and molecular ring-currents, where we have recently made progress. Lastly, I will show that using the dynamical symmetry group-theory allows defining new intrinsic chirality properties for electromagnetic fields, these may pave the way for novel spectroscopy techniques.

Host: Angel Rubio, Simone Latini

