
COLLOQUIA DI DOTTORATO, A.A. 2022/2023

Dipartimento di Fisica, A101
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Ultrafast XUV spectroscopy based on high-order harmonic generation

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High-order harmonics are generated from the interaction of intense femtosecond laser pulses with noble gases. Recently, high-order Harmonic Generation (HHG) led to the realisation of table-top sources of coherent XUV and Soft-X Ray radiation. With these sources, ultrafast spectroscopy can be performed with extreme temporal resolutions, down to the attosecond regime, and with the site and chemical selectivity. These features grant access to purely electronic dynamics in molecules and solids and fundamental processes of light-matter interaction. Furthermore, HHG has been successfully used as a spectroscopic tool in the gas phase and condensed matter, allowing the study of electron dynamics in a cation following sudden ionisation, all-optical band structure reconstruction, and berry phase retrieval. These findings demonstrate the flexibility and potentiality of this technique.

In this colloquium, the principle of high-order harmonic generation as a source of XUV radiation is introduced, together with its application for ultrafast XUV spectroscopy and high-order harmonic spectroscopy. Recent developments in efficient XUV generation in microfluidic devices fabricated by femtosecond laser irradiation followed by chemical etching will be also discussed.