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Harmonic phases and attosecond electron dynamics in small molecules: Challenges for theory

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We shall present recent results [1] on the analysis (amplitudes and phases) of harmonic spectra from oriented N₂ molecules, in the presence of a strong IR laser. As we shall show, under certain conditions, it is possible not only to image the outer molecular orbitals [2], but also to probe a bound electron-hole wave packet created in the course of the harmonic generation process, with attosecond resolution. The challenges for theory will be emphasized.

[1] Haessler, S., Caillat, J., Boutu, W., Giovanetti-Teixeira, C., Ruchon, T., Auguste, T., Diveki, Z., Breger, P., Maquet, A., Carré, B., Taïeb, R., Salières, P.
Attosecond imaging of molecular electronic wavepackets
NATURE PHYSICS, 6 (3): 200-206 (2010)

[2] Itatani J, Levesque J, Zeidler D, Niikura H, Pepin H, Kieffer JC, Corkum PB, Villeneuve DM
Tomographic imaging of molecular orbitals
NATURE, 432, 867-871 (2004)