

Abstract Submitted  
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**Ultrafast laser-assisted photoprotection mechanism in the adenine cation** VINCENT WANIE, ERIK MAANSSON, DESY, SIMONE LATINI, FABIO COVITO, MPI, MARA GALLI, DESY, ENRICO PERFETTO, CNR-ISM, GIANLUCA STEFANUCCI, Universita di Roma Tor Vergata, HANNES HUBENER, UMBERTO DE GIOVANNINI, MPI, MATTEA CASTROVILLI, CNR-ISM, ANDREA TRABATTONI, DESY, FABIO FRASSETTO, LUCA POLETTO, CNR-IFN, JASON GREENWOOD, Queen's University, FRANCOIS LEGARE, INRS, MAURO NISOLI, Politecnico di Milano, ANGEL RUBIO, MPI, CCQ, FRANCESCA CALEGARI, DESY — Attosecond pulses have become a mature tool for tracking in real time nuclear and electronic dynamics in systems with increasing complexity. Our particular interest is the ultrafast response of DNA building blocks upon irradiation, from which photostability and bond breaking emerge. Through time-resolved photo-fragmentation measurements, we demonstrate a laser-assisted photoprotection scheme in the adenine nucleobase. Surprisingly, a path to retain the molecule structurally intact arises when a near infrared (NIR) pulse is sent precisely 2.3 fs after ionization by an isolated attosecond XUV pulse. Without the properly timed NIR, the singly or doubly photoionized adenine dissociates, as confirmed by TDDFT simulations. Rate equations and ab-initio many-body time-dependent calculations based on Green's function associate this characteristic 2.3 fs delay to the population of a specific shake-up state after XUV ionization, driving the electronic density away from the molecular plane. Depletion of this shake-up state by the NIR pulse accounts for internal energy removal from the molecule and leads to a stable dication.

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