



DIPARTIMENTO DI SCIENZE
MATEMATICHE E INFORMATICHE,
SCIENZE FISICHE E SCIENZE DELLA TERRA
Dottorato di Ricerca in Fisica

Appunti di Fisica '22

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Aula A1-6, polo Papardo

Ultrafast spectroscopy of two-dimensional materials: from semiconductors to superconductors

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The layered transition metal dichalcogenides (TMDs) with form MX_2 are a class of two-dimensional materials with a diverse range of properties depending on the choice of metal, M and chalcogen, X. The most well-known are the semiconducting compounds (e.g., MoS_2 , WS_2 etc.) studied for their extremely robust excitonic properties, which has led to interesting Moiré physics and new ways to exploit electronic and lattice degrees of freedom in devices such as valleytronics and twistronics. The other group contains the metallic compounds (e.g., TaSe_2 , NbSe_2 etc.) which exhibit strongly correlated behaviour such as charge density waves (CDWs), ferromagnetism, Mott insulating states, and superconductivity. In this talk, I will present my most recent work on these two distinctly different groups of TMD materials and how we utilise ultrafast spectroscopy techniques to study their electron and phonon dynamics in the time-domain.

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