



UNIVERSITÀ  
degli STUDI  
di CATANIA



DIPARTIMENTO DI FISICA E ASTRONOMIA  
“ETTORE MAJORANA”

DOTTORATO DI RICERCA IN FISICA  
CICLO XL A.A. 2024/2025

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## DIRECT REACTIONS WITH HEAVY IONS

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### Teaching staff

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**Office:** INFN-LNS, Via S. Sofia 64, Catania, Room 204/a and 225

**Reception hours:** Friday 15:00-17:00

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### Program of the course:

The concept of direct nuclear reaction. “Direct” vs “compound”. Relevant observables of a direct reaction. Energy spectra and cross section distributions. Theoretical description of direct reactions involving heavy ions. DWBA approximation and limits of applicability. Eikonal vs. black disk approximation for heavy ion reactions. Optical model and elastic scattering. Inelastic excitations: coupled channels method. Selected phenomenology of direct reactions: Heavy Ion Charge Exchange and Transfer Reactions in DWBA. N-step reactions.

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### Bibliography:

- ✓ G.R. Satchler, Direct Nuclear Reactions, Edited by Oxford University Press, 1983
- ✓ J. Gómez Camacho, A.M. Moro, C. Scheidenberger, M. Pfützner (eds.), The Euroschool on Exotic Beams, Vol. IV, Lecture Notes in Physics 879, DOI 10.1007/978-3-642-45141-6\_2, Springer-Verlag Berlin Heidelberg 2014 (provided during classes)
- ✓ I.J. Thomson, Computer Physics Reports 7 (1988) 167-212 (provided during classes)