



UNIVERSITÀ  
degli STUDI  
di CATANIA

DIPARTIMENTO DI FISICA E ASTRONOMIA

DOTTORATO DI RICERCA IN FISICA

ANNO ACCADEMICO 2019 - 2020

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## Direct Reactions with Heavy Ions

2 CFU

### Teaching staff

**Nome Cognome:** Francesco Cappuzzello, Maria Colonna

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**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)