



Dipartimento di Fisica  
Università di Cagliari  
INFN, Sezione di Cagliari



# HIGH ENERGY PHYSICS COLLOQUIA

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Matteo Trudu

*Università di Cagliari*

## AN INTRODUCTION TO GRAVITATIONAL LENSING AND A POSSIBLE COMBINED ANALYSIS WITH ROTATION CURVES

### Abstract

One of the consequences of Einstein's General Theory of Relativity is the deflection of light by massive bodies. The phenomena resulting therefrom are now referred to as Gravitational Lensing. The theory, observations, and applications of gravitational lensing constitute one of the most rapidly growing branches of extragalactic astrophysics. The deflection of light from very distant sources by masses on our line of sight provides a unique possibility for the investigation of both background sources and lens mass distributions.

One of the most compelling issues of fundamental physics is the origin of the dark matter in our Universe which dominates the gravitational field of individual galaxies and galaxy clusters. A successful technique with which to investigate it has so far been the effect of gravitational lensing. An interesting work\* proposes an enhanced formalism for lensing measurements and rotation curves to a first post-Newtonian approximation that can in principle be used to reinterpret existing data in a more general context and therefore might shed new light on the open question concerning the nature of the dark matter.

In this seminar I will briefly review the principal concepts in gravitational lensing and I will show, from a theoretical point of view, the basic outlines of this enhanced formalism showing that a combined measure of rotation curves and gravitational lensing could be used to determine the equation of state of the galactic fluid.

\*T. Faber and M. Visser, "*Combining rotation curves and gravitational lensing: How to measure the equation of state of dark matter in the galactic halo*", Mon. Not. Roy. Astron. Soc. 372 (2006) 136 [arXiv:astro-ph/0512213]

### Contatti:

Mariano Cadoni ([mariano.cadoni@ca.infn.it](mailto:mariano.cadoni@ca.infn.it))

<http://theory.ca.infn.it/seminars/>

